DIVISION 3 - CONCRETE

DIVISION 4 - MASONRY (NOT USED)

DIVISION 5 - METALS

DIVISION 6 THRU 12 - (NOT USED)

DIVISION 13 - SPECIAL CONSTRUCTION

DIVISION 14 THRU 16 - (NOT USED)

xxx

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SECTION 00800 - SPECIAL CLAUSES

1 THRU 4. NOT USED.

5. PAY REQUESTS. Pay requests authorized in the Contract Clause entitled "Payments Under Fixed-Price Construction Contracts", will be paid pursuant to the clause entitled "Prompt Payment for Construction Contracts". Pay requests shall be submitted on ENG Form 93 and 93a, "Payment Estimate-Contract Performance" and "Continuation", respectively. All information and substantiation required by the identified contract clauses shall be submitted with the ENG Form 93, and the required certification shall be included on the last page of the ENG Form 93a, signed by an authorized official of the Contractor and dated when signed. The designated billing office is the Office of the Area Engineer.

6. PHYSICAL DATA (APR 1984). FAR 52.236-4. Data and information furnished or referred to below is furnished for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

a. Physical Conditions. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by surveys and borings. Information regarding these borings and additional information regarding National Pollutant Discharge Elimination System (NPDES) stormwater discharge rules are available for inspection upon 48 hours notice at the Dept. of the Army, St. Louis District, Corps of Engineers, 1222 Spruce Street, St. Louis, Missouri.

b. Weather Conditions. Information with respect to temperatures and precipitation may be obtained from the National Weather Service.

c. Transportation Facilities. Railroads and highways serve the general area of the work.

7. RIGHT-OF-WAY.

a. Right-of-way for construction purposes will be furnished by the Government without cost to the Contractor. Where right-of-way for access to a work site is not available over existing public roads, access through private lands as shown on the contract drawings will be furnished by the Government without cost to the Contractor. If the right-of-way furnished for access is used, the Contractor will be required at its own expense, to do all work necessary to make such right-of-way suitable for traveling to and from the work site without interrupting the existing drainage. Upon completion of the contract work, any such access roadway and right-of-way furnished by the Government shall be left in a condition satisfactory to the Contracting Officer.

b. The Contractor shall procure without expense to the Government all additional lands, access roads, or right-of-way necessary for its use in the performance of the work. Any agreements or permits with levee boards, counties, or political subdivisions for moving material and equipment will also be the responsibility of the Contractor. Any delays to the Contractor resulting from delays in procuring such additional lands, access roads, right-of-way, or permits for moving material and equipment for its own use will not be made a basis of any claim for increases in the cost of performance of the work. The Contractor shall make its own investigations to determine

the conditions, restrictions, and difficulties which may be encountered in the transportation of material and equipment to the work sites shown on the drawings.

8. PUBLIC UTILITIES AND PRIVATE IMPROVEMENTS.

a. Unless otherwise specified, shown on the drawings, or stated in writing by the Contracting Officer, the Contractor shall not move or disturb any public utilities or private improvements. Such removals, alterations, and/or relocations, where necessary, will be made by others. The locations shown on the drawings for underground utilities are approximate only. The exact locations of such utilities shall be determined by the Contractor in the field prior to commencing construction operations in their vicinity.

b. The attention of the Contractor is directed to the possibility that public utilities or private improvements may be encountered within the construction limits, some of which may be buried, and the existence of which is presently not known. Should any such utilities or improvements be encountered, the Contractor shall immediately notify the Contracting Officer so that a determination may be made as to whether they shall be removed, relocated, or altered. After such determination is made, the Contractor shall, if so directed by the Contracting Officer, remove, relocate, or alter them as required and an equitable adjustment will be made. In the event the Contracting Officer arranges for such removals, alterations, or relocations to be performed by others, the Contractor shall cooperate with such others during the latters' removal, alteration, or relocation operations.

9. DAMAGE TO WORK.

a. The responsibility for damage to any part of the work to be performed under this contract shall be as set forth in the clause of the contract entitled "Permits and Responsibilities". However, if the cofferdam(s) is constructed in accordance with plans and progress schedules approved by the Contracting Officer, but is overtopped by flood and such flood causes damage to the cofferdam or if any part of the permanent work is damaged by flood or earthquake, which damage is not due to the failure of the Contractor to take reasonable precaution or to exercise sound engineering and construction practices in the conduct of the work, the Contractor shall make the repairs ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such damaged work, an equitable adjustment pursuant to the Contract Clause entitled, "Changes", will be made as full compensation therefor.

10. LAYOUT OF WORK.

a. The Government will establish the following base lines and bench marks at the site of the work:

1) Reestablish 2 points on the 1988 Survey Baseline

2) Benchmarks at spillway detention reservoir, inlet and outlet channels, and the access road

b. From the base lines and bench marks established by the Government, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the

work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

c. The Contractor shall furnish at its own expense such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed by the Contractor or through its negligence prior to their authorized removal, they may be replaced by and at the discretion of, the Contracting Officer, and the expense of replacement will be deducted from any amounts due or to become due the Contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

11. QUANTITY SURVEYS (APR 1984). FAR 52.236-16

a. Quantity surveys shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.

b. The Government shall conduct the original and final surveys and make the computations based on them. The Contractor shall conduct the surveys for any periods for which progress payments are requested and shall make the computations based on these surveys. All surveys conducted by the Contractor shall be conducted under the direction of a representative of the Contracting Officer, unless the Contracting Officer waives this requirement in a specific instance.

c. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer.

12. PARTIAL PAYMENT. At the discretion of the Contracting Officer, partial payment will be made for equipment delivered and stored on site or off site providing such storage is in accordance with the provisions of these specifications and the Contractor furnishes satisfactory evidence that title to such equipment has been acquired and that it will be utilized on the work covered by these specifications. Partial payment is defined as the invoice amount plus shipping costs. If the equipment is stored off site, the Government shall have the right to inspect the equipment.

13. NOT USED.

14. CERTIFICATES OF COMPLIANCE. Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in 3 copies. Each certificate shall include the signature and title of an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification

shall not be construed as relieving the Contractor from responsibility for furnishing satisfactory material if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

15. PURCHASE ORDERS. Two copies of all purchase orders for other than stock materials showing the firm names and addresses and list of material shall be furnished to the Contracting Officer or an authorized representative as soon as issued.

16. SAFETY AND HEALTH REQUIREMENTS MANUAL EM 385-1-1. Safety and Health Requirements Manual EM 385-1-1, dated September 3, 1996, forms a part of these specifications.

17. ACCIDENT INVESTIGATIONS AND REPORTING. Refer to EM 385-1-1, Paragraph 01.D. Accidents shall be investigated and reports completed by the immediate supervisor of the employee(s) involved and reported to the Contracting Officer or an authorized representative within one working day after the accident occurs. The accident Investigation report shall be made on ENG Form 3394.

18. ACCIDENT PREVENTION PROGRAM. Refer to Contract Clause FAR 52.236-13 entitled, "Accident Prevention". Within 15 days after receipt of Notice of Award of the contract, and at least 7 days prior to the prework conference, the original and one copy of the Accident Prevention Program shall be submitted to the Contracting Officer for review. The program shall be prepared in the following format:

a. An executed LMV Form 358R, Administrative Plan.

b. An executed LMV Form 359R, Activity Hazard Analysis.

c. A copy of company policy statement of accident prevention and any other guidance statements normally provided new employees. Each company employee shall be required to sign the company policy statement of accident prevention to verify that all employees have been informed of the safety program, and such signed statements shall be maintained at the project site.

The Contractor shall not commence physical work at the site until the program has been reviewed and found acceptable by the Contracting Officer, or an authorized representative. At the Contracting Officer's discretion, the Contractor may submit its Activity Hazard Analysis only for the first phase of construction provided that it is accompanied by an outline of the remaining phases of construction. All remaining phases shall be submitted and accepted prior to the beginning of work in each phase. Also refer to Section 1 of EM 385-1-1.

19. DAILY INSPECTIONS. The Contractor shall perform daily safety inspections and record them on the forms approved by the Contracting Officer. Reports of daily inspections shall be maintained at the job site. The reports shall be records of the daily inspections and resulting actions. Each report shall include, as a minimum, the following:

a. Phase(s) of construction underway during the inspection.

b. Locations of areas inspections were made.

c. Results of inspection, including nature of deficiencies observed and corrective actions taken, or to be taken, date, and signature of the person responsible for its contents.

20. NOT USED.

21. ENVIRONMENTAL LITIGATION.

(a) If the performance of all or any part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, the Contracting Officer, at the request of the Contractor, shall determine whether the order is due in any part to the acts or omissions of the Contractor or a Subcontractor at any tier not required by the terms of this contract. If it is determined that the order is not due in any part to acts or omissions of the Contractor or a Subcontractor at any tier other than as required by the terms of this contract, such suspension, delay, or interruption shall be considered as if ordered by the Contracting Officer in the administration of this contract under the terms of the Contract Clause entitled "Suspension of Work". The period of such suspension, delay or interruption shall be considered unreasonable, and an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) as provided in that clause, subject to all the provisions thereof.

(b) The term "environmental litigation", as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the Government has not duly considered, either substantively or procedurally, the effect of the work on the environment.

22. TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER.

a. This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the Contract Clause entitled, "Default (Fixed-Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(4)	(5)	(5)	(6)	(7)	(8)	(9)	(9)	(6)	(7)	(7)	(5)

c. Upon acknowledgement of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily

CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph b, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the Contract Clause entitled "Default (Fixed Price Construction)".

23. SUBCONTRACTS. In accordance with the Contract Clause entitled "Subcontracts", the Contractor shall, within seven days after the award of any subcontract by the Contractor or a Subcontractor, deliver to the Contracting Officer two copies of a completed Standard Form 1413. Both copies must contain the original signatures of both parties.

24. REQUIRED INSURANCE - WORK ON A NON-GOVERNMENT INSTALLATION.

a. The Contractor shall, at its own expense, provide and maintain during the entire performance period of this contact at least the kinds and minimum amounts of insurance required in the following schedule:

(1) Workmen's Compensation. Amounts required by applicable jurisdictional statutes.

(2) Employer's Liability Insurance. $100,000

(3) Comprehensive General Liability Insurance.

Bodily Injury and Property Damage: $1,000,000 per occurrence
$100,000 per person

(4) Comprehensive Automobile Insurance.

Bodily Injury and Property Damage: $1,000,000 per occurrence
$100,000 per person

In addition to the insurance requirements above, the Contractor and any subcontractor, shall obtain supplemental insurance naming the City of Cape Girardeau as an additional insured. These insurance requirements shall be obtained prior to commencement of work and maintained during the entire period of performance of this contract while working in the City of Cape Girardeau. This certificate shall state that the insurance carrier will give the Grantor, the City of Cape Girardeau, 30 days written notice, of cancellation or changes.

b. Within 15 days after receipt of Notice of Award and before commencing work under this contract, the Contractor shall notify the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective (1) for such period as the laws of the State in which this contract is to be performed prescribe, or (2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

c. The Contractor shall insert the substance of this clause,

including this paragraph c, in subcontracts under this contract and shall require subcontractors to provide and maintain the insurance required in paragraph a above. The Contractor shall maintain a copy of all subcontractor's proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

d. Statements of insurance should be submitted to the following address:

Department of the Army
St. Louis District, Corps of Engineers
Southern Area Office, CEMVS-CO-CS
Room 102, Federal Building
Cape Girardeau, Missouri 63701

25. PROTECTION OF MATERIAL AND WORK. The Contractor shall at all times protect and preserve all materials, supplies, and equipment of every description (including property which may be Government -furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to enclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies, and work performed are not adequately protected by the Contractor, such property may be protected by the Government and the cost thereof may be charged to the Contractor or deducted from any payments due to the Contractor.

26. CONTAMINATION OF WATER. In addition to the requirements set forth in 01130-3.3, Protection of Water Resources, the Contractor shall take positive protective measures to prevent spillage of potential pollutant materials such as fuel, emulsion materials, chemicals etc., from storage containers or equipment, into lakes or tributary waters. Such positive protective measures may include, but not limited to, the following:

(1) A berm enclosure of sufficient capacity to contain such materials.

(2) Security measures to prevent acts of vandalism which could result in spillage of such materials (fences, guards, etc.).

(3) Storage of such materials in an area where the terrain would preclude leakage into lake or tributary waters.

(4) Utilization of secure Government storage areas if the Contracting Officer indicates such space is available. No storage past immediate needs (2 days) without the consent of the Contracting Officer.

The Contractor shall submit its proposals for implementing the above provisions in accordance with 01130 -1.5, Environmental Protection Plan.

27. NOT USED.

28. COMMERCIAL WARRANTY. The Contractor agrees that the standard commercial equipment furnished under this contract shall be covered by the most favorable commercial warranties the manufacturer gives to any customer for such equipment, and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to the Government by any other clause of this contract. The Contractor shall furnish two copies of the warranties to the Contracting Officer.

29. ORDER AND COORDINATION OF WORK. The Contractor may start and complete the work in such order and sequence as desired subject to compliance

with the following paragraphs:

a. The Contractor shall be responsible for gaining authority from all county and/or road officials to haul the material over county and township roads. Any liability incurred by damage to these public roads will be the responsibility of the Contractor. The Contractor shall furnish certified copies to the Contracting Officer of all hauling permits from State, County and Township authorities fifteen (15) days prior to commencing delivery of any material under this contract if so required by said road authorities.

b. The Contractor shall comply with all local laws and ordinances of the City of Cape Girardeau and MDNR.

c. Order of work inside the limits of protection of the cofferdam, including construction of the cofferdam:

1. Construct sewer line within the cofferdam.
2. Construct Temporary Diversion Channel starting from the downstream end and working upstream towards the confluence with the existing channel. Existing channel is not diverted at this phase of construction.
3. Construct earthen cofferdam adjacent to the Temporary Diversion Channel. This phase of construction does not include the upstream and downstream terminus of the earthen cofferdam.
4. Divert the existing channel into the Temporary Diversion Channel.
5. Construct earthen cofferdam upstream and downstream terminus.
6. Construct the Outlet Works and stone protection.
7. Redirect the Temporary Diversion Channel flow into (permanent) Outlet Works.
8. Construct inspection trench within the cofferdam limits.
9. Degrade the earthen cofferdam and fill in Temporary Diversion Channel.

Work that is outside the protection of the Cofferdam may be done concurrently with work inside the protection, except that construction of the sewer line shall be accomplished first, and no portion of the embankment dam shall be constructed until after the cofferdam is degraded ..

Note: In the Specifications and Drawings, the term “Cutoff Trench” is synonymous with the term “Inspection Trench”.

30. NOT USED.

31. AS-BUILT DRAWINGS.

a. "As-Built" Contract Drawings. The Contractor shall maintain a separate set of full-size contract drawings, marked up in red, to indicate as-built conditions. Each as-built contract drawing shall include the Contract Number (DACW43-XX-C-XXXX) associated with the contract. These drawings shall be maintained in a current condition at all times until completion of the work and shall be available for review by Government personnel at all times. All variations from the contract drawings, for whatever reason, including those occasioned by modifications, optional materials, and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the

contract drawings. Upon completion of the work, two (2) sets of the marked-up drawings shall be furnished to the Contracting Officer prior to acceptance of the work. The Government will withhold two percent of the total bid price of the items for which as-built contract drawings have not been submitted.

b. "As-Built" Shop Drawings. Upon completion of items of work, the Contractor shall revise the shop drawings to show "as-built" conditions. The notation "Revised to show 'as-built' conditions" shall be placed in red in the lower right corner of each drawing along with the initials of a responsible company representative. Each as-built shop drawing or catalog cut shall be identified by the Contract Number (DACW43-XX-C-XXXX) associated with the contract, and corresponding transmittal number from ENG Form 4025. "As-built" shop drawings of each Contractor-prepared construction drawing should be prepared as soon as possible after the construction detailed on a given drawing has been completed. After the "as-built" shop drawings have been prepared as described above and within 15 days after the contract completion date, the Contractor shall submit four (4) complete sets of as-built shop drawings, including catalog cuts, to the Contracting Officer. The Government will withhold two percent of the total bid price of the item for which as-built shop drawings have not been submitted.

32 THRU 39. NOT USED

40. STONE SOURCES.

a. On the basis of information and data available to the Contracting Officer, stone meeting the quality requirements of these specifications has been produced from the sources listed at the end of these Special Clauses.

b. Stone may be furnished from any of the currently listed sources or, at the option of the Contractor, may be furnished from any other source designated by the Contractor and accepted by the Contracting Officer, subject to the conditions hereinafter stated.

c. It is the Contractor's responsibility to determine that the stone source or combination of sources selected are capable of supplying the quantities and gradation needed and at the rate needed to maintain the scheduled progress of the work.

d. After the award of the contract, the Contractor shall designate in writing only one source or one combination of sources from which stone will be furnished. If the Contractor proposes to furnish stone from a source not currently listed, only a single additional source for stone may be designated. Samples for acceptance testing shall be provided as required by SECTION-02270. If a source for stone so designated by the Contractor is not accepted for use by the Contracting Officer, the Contractor may not propose other sources but shall furnish the stone from a source listed at no additional cost to the Government.

e. Acceptance of a source of stone is not to be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels when such materials are unsuitable for stone as determined by the Contracting Officer. Materials produced from a listed or unlisted source shall meet all the requirements of SECTION 02270, of the Technical Provisions of these specifications.

41. AGGREGATE SOURCES.

a. Concrete aggregates meeting the quality requirements of these specifications, except as noted in the Stone Source List attached at the end of the section, can be produced from the sources listed below:

Type of Aggregate	Name of Firm	Location
Coarse Aggregate	Bussen Quarry	St. Louis Co., MO
Coarse Aggregate	Bluff City Mineral	Alton, IL
Coarse Aggregate	Fort Belle Quarry	Ft. Bellefontaine, MO
Coarse Aggregate	Material Service Quarry	Falling Springs, IL
Coarse Aggregate	Columbia Quarry No. 1	Columbia, IL
Coarse Aggregate	Bellefontaine Quarry	Fort Bellefontaine, MO
Coarse Aggregate	Central Stone #1	Huntington, MO
Coarse Aggregate	All firms producing gravel from the Meramec River, St. Louis and Jefferson Counties, MO	
Coarse Aggregate	Southeast Missouri Stone Co.	Cape Girardeau, MO
Coarse Aggregate	Tower Rock Stone Company	Grays Point, MO
Coarse Aggregate	Tower Rock Stone Company	Ste. Genevieve, MO
Fine Aggregate	All firms producing sand from the Missouri River and from the Mississippi River below the mouth of the Missouri River.	

b. Concrete aggregates may be furnished from any of the above listed sources or at the option of the Contractor may be furnished from any other source designated by the Contractor and approved by the Contracting Officer, subject to the conditions hereinafter stated.

c. After the award of the contract, the Contractor shall designate in writing only one source or one combination of sources from which aggregates will be furnished. If the Contractor proposes to furnish aggregates from a source not listed above, only one unlisted source for coarse aggregate and one unlisted source for fine aggregate may be designated. Samples for acceptance testing shall be provided as required by SECTIONS 03301 and 03310, of the Technical Provisions. If a source for coarse or fine aggregate so designated by the Contractor is not approved for use by the Contracting Officer, the Contractor may not submit for approval other sources but shall furnish the coarse or fine aggregate, as the case may be, from a source listed above at no additional cost to the Government.

d. Approval of a source of concrete aggregate shall not be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata or channels, when such materials are unsuitable for concrete aggregate as determined by the Contracting Officer. Materials produced from an approved source shall meet all the applicable requirements of SECTIONS 03301 and 03310.

e. It shall be the Contractor's responsibility to determine that

the aggregate sources selected are capable of supplying the quantities needed and at the rate needed to maintain the scheduled progress of work.

42 THRU 44. NOT USED.

45. YEAR 2000 COMPLIANCE (Y2K). In accordance with FAR 39.106, the Contractor shall ensure that with respect to any design, construction, goods or services under this contract as well as any subsequent task/delivery orders issued under this contract (if applicable), all information technology contained therein shall be Year 2000 compliant. The Contractor shall:

(a) Perform, maintain, and provide an inventory of all major components to include structures, equipment, items, parts, and furnishings under this contract and each task/delivery order that may be affected by the Y2K compliance requirement;

(b) Indicate whether each component is currently Year 2000 compliant or requires an upgrade for compliance prior to Government acceptance.

46. HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997). FAR 52.223-3

(a) "Hazardous material", as used in this clause, includes any material defined as hazardous under the latest version of 29 CFR 1910.1200(g) (including revisions adopted during the term of the contract).

(b) The offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material (If none, insert "None")	Identification No.
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with 29 CFR 1910.1200(g), whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offeror being considered nonresponsive and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to 29 CFR 1910.1200(g), which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to --

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(l) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources.

47. PARTNERING. In order to most effectively accomplish this contract, the Government is willing to form a cohesive partnership with the Contractor. This partnership would strive to draw on the strengths of each organization in an effort to achieve a quality project done right the first time, within budget, and on schedule. This partnership would be bilateral in make-up and partnership will be totally voluntary. Any cost associated with effectuating this partnership will be agreed to by all parties and will be shared equally with no change in contract price.

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SECTION 01025
MEASUREMENT AND PAYMENT

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SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

DETENTION RESERVOIR

1.1 MOBILIZATION AND DEMOBILIZATION. Payment for costs associated with mobilization and demobilization will be made at the contract lump sum price for "Mobilization and Demobilization", as defined in SECTION 00700, Contract Clauses. Mobilization and Demobilization for the interceptor sewer will be paid as being incidental to the bid item to which it is most closely associated.

1.2 CLEARING AND GRUBBING. Payment for clearing and grubbing as specified in SECTION 02100 will be made at the contract lump sum price for "Clearing and Grubbing", which price and payment shall constitute full compensation for furnishing all plant, labor, material, and equipment and performing all operations necessary for completing the work as specified and as indicated on the drawings. Clearing and Grubbing for the interceptor sewer will be paid as being incidental to the bid item to which it is most closely associated.

1.3 OVERBURDEN EXCAVATION.

1.3.1 Measurement. All earth excavation other than borrow excavation will be measured for payment by the cubic yard with quantities being determined by the average end area method. An initial survey of the work area will be made prior to the commencement of work. The basis of measurement will be the area between the original ground surface and lines, grades, and other dimensions of the excavations, or the top of rock, all as shown on the drawings, or such modification thereof as directed by the Contracting Officer and determined by a survey of the area subsequent to completion of the excavation of respective material.

1.3.2 Payment. Payment for all earth excavation other than borrow excavation will be made at the contract unit price per cubic yard for "Overburden Excavation", which price and payment shall constitute full compensation for furnishing all plant, labor, materials, equipment and operations necessary for stripping, removing the excavated material, transporting suitable excavated material to the site of its placement in the embankment, placing excavated material in temporary stockpiles and subsequent excavation and transportation of the material to the required fill, transporting and disposing of excavated material ordered wasted, and shaping the disposal areas as specified.

1.4 ROCK EXCAVATION.

1.4.1 Measurement. Rock excavation will be measured for payment by the cubic yard with quantities being determined by the average end area method. The basis of measurement will be the area between the top of rock as determined by the Contracting Officer, and the lines and grades of the completed rock excavation as determined by a survey taken subsequent to completion of the rock excavation. Any unauthorized overcut beyond the tolerance specified in SECTION 02225, paragraph 3.9, for lines and grades shown on the drawings or established in the field by the Contracting Officer will be deducted from the above determined quantity. Materials encountered during earth excavation and which are classified as rock excavation, as specified in SECTION 02225, paragraph 1.3, will be included as rock excavation.

1.4.2 Payment. Payment for rock excavation will be made at the applicable contract unit price per cubic yard for "Rock Excavation:" subdivided items, which prices and payments shall constitute full compensation for the costs of all plant, labor, materials, and equipment required for drilling, ripping, excavating, loading, hauling, removing, and disposing of excavated rock and scaling of rock slopes.

1.5 FOUNDATION CLEANUP FOR INSPECTIONS.

1.5.1 Measurement. Measurement of foundation cleanup for inspections will be based on the number of square yards of foundation area satisfactorily cleaned, as directed by the Contracting Officer, measured in a plane parallel to the foundation surfaces.

1.5.2 Payment. Payment for foundation cleanup for inspections will be made at the applicable contract unit price per square yard for "Foundation Cleanup for Inspections:" subdivided items, which prices and payments shall constitute full compensation for the costs of furnishing all necessary plant, labor, equipment, supplies, and materials, and performing all operations necessary to accomplish the work as specified. No separate payment will be made for inspections in relation to the final foundation and all costs in connection therewith shall be included in the contract unit price for "Final Foundation Preparation."

1.6 FINAL FOUNDATION PREPARATION.

1.6.1 Measurement. Measurement of final foundation preparation will be based on the number of square yards of foundation prepared, measured in a plane parallel to the foundation surfaces.

1.6.2 Payment. Payment for final foundation preparation will be made at the contract unit price per square yard for "Final Foundation Preparation:" subdivided items, which price and payment shall constitute full compensation for the costs of all plant, labor, equipment, supplies, and materials required, and the performance of all operations necessary for conducting the work as specified.

1.7 DENTAL EXCAVATION AND CONCRETE BACKFILL.

1.7.1 Measurement. Dental excavation and concrete backfill will be measured for payment on the basis of either (1) surveys taken by the Contracting Officer prior to commencement of, and after completion of, dental excavation, or (2) the volume of concrete required to backfill the dental excavation, whichever the Contracting Officer determines as being the most practicable method.

1.7.2 Payment. Payment for dental excavation and concrete backfill will be made at the applicable contract unit price per cubic yard for "Dental Excavation and Concrete Backfill:" subdivided items, which prices and payments shall constitute full compensation for the costs of furnishing all labor, equipment, and materials and for performing all work required for excavation, moving, hauling, and disposing of excavated materials; and for the costs of all work and materials required in backfilling the holes or cavities, including the cleaning and preparation of the rock surfaces, concrete materials and placement.

1.8 EXCAVATION AND CONCRETE BACKFILL OF CLAY-FILLED DEPRESSIONS.

1.8.1 Measurement. Excavation of large clay-filled depressions in the bedrock surface and concrete backfill of these areas will be measured as

specified in paragraph 1.7.1 above.

1.8.2 Payment. Payment for the excavation and concrete backfill of the clay-filled depressions will be made at the applicable contract unit price per cubic yard for "Excavation and Concrete Backfill of Clay-Filled Depressions:" subdivided items, which prices and payments shall constitute full compensation for the costs of furnishing all plant, labor, equipment, and materials and for performing all work required for excavation, moving, hauling and disposing of excavated materials; and for backfilling the holes or cavities, including the cleaning and preparation of the rock surfaces, concrete materials and placement.

1.9 EMBANKMENT.

1.9.1 Measurement. Embankment will be measured in place as follows:

(1) The volume between (a) the foundation lines as determined on the basis of a survey made from excavation including the inspection/cutoff trench, and accomplishment of foundation preparation including stripping but excepting scarifying, and (b) the lines, grades and slopes of the accepted embankment;

(2) Plus any allowances for foundation settlement determined from readings of movement monuments installed under the provisions of SECTION 13500 - INSTRUMENTATION, which will be computed as follows:

(a) Zero settlement will be assumed at the upstream and downstream toes of the embankment.

(b) A straight line variation will be assumed between individual movement monuments as well as between movement monuments and points of zero settlement.

(3) Measurement of each type of material will be the volume between the above described limit lines and the payment lines indicated on the cross sections, shown on the drawings, or as otherwise established by the Contracting Officer.

1.9.2 Payment.

1.9.2.1 Compacted Impervious Fill Payment. Compacted impervious fill placed in the embankment will be paid for at the applicable contract unit price per cubic yard for "Compacted Fill, Impervious Embankment", and "Compacted Fill, Impervious Cofferdam", which prices and payments shall constitute full compensation for all work in connection with the preparation of the foundation of the embankment, and the spreading, harrowing, sprinkling, compacting, removal of objectionable material, and all other incidental work required for the construction, protection, and maintenance of the embankment as specified.

1.9.2.2 Sand Fill and Sand Backfill Payment. Payment for the sand fill and sand backfill material will be made at the contract unit price per cubic yard for "Sand Fill and Sand Backfill", which price and payment shall constitute full compensation for all costs of furnishing, hauling, placing, adding water, compacting and all other work required for the construction, protection and maintenance of the sand fill and sand backfill.

1.9.2.3 Uncompacted Fill Payment. No separate payment will be made for uncompacted fill and all costs incidental to spreading, protecting, and maintenance of such fill shall be included in the contract price for excavation of the material.

1.10 UNDISTURBED BLOCK SAMPLES. Undisturbed block samples delivered to the Contracting Officer will be paid for at the contract unit price per each for "Undisturbed Block Samples", which price and payment shall constitute full compensation for furnishing the undisturbed block samples as specified.

1.11 CONSTRUCTION DEWATERING AND/OR CARE OF WATER. Payment for dewatering will be made at the contract lump sum price for "Construction Dewatering and/or Care of Water", which price and payment shall constitute full compensation for furnishing all plant, labor, material, and equipment to do the work as specified in SECTION 02140 and applicable parts of SECTION 13500. Fifty percent of the lump sum price will be paid when installation of the dewatering system has been completed, tested, evaluated, and the piezometric level of the groundwater has been lowered to acceptable levels as defined in SECTION 02140, paragraph 3.1. Forty percent of the lump sum price will be prorated on the basis of the estimated number of months that dewatering will be required, and will be paid monthly. The remaining 10 percent of the lump sum price will be paid when the dewatering system has been removed as required and cleanup in connection therewith has been completed.

1.12 UNWATERING SUBSEQUENT TO FLOODING. Payment for all operating costs for additional unwatering due to flooding ordered by the Contracting Officer will be made at the contract unit price per each occurrence for "Unwatering Subsequent to Flooding:" subdivided items.

1.13 RIPRAP AND CRUSHED STONE BEDDING.

1.13.1 Measurement. Riprap and crushed stone bedding material will be measured for payment by the ton (2,000 lbs.). Final quantities will be rounded to the nearest whole ton. The weights to be paid for will be determined from certified weight tickets which shall be furnished by the Contractor at no additional cost to the Government. A certified weight ticket shall be defined as each truck being weighed empty, and again when loaded and the ticket, identified by the Contractor's name and the contract number, shall be signed by the approved quarry representative with the statement "Certified Correct". This procedure will be followed for each load hauled. The Contractor shall initial each ticket to reflect verification of the accuracy and completeness of each ticket before submitting it to the Government. The Contractor shall furnish certification stating that the scales used were tested and approved by the local authority.

1.13.2 Payment. Payment for riprap and crushed stone bedding material will be made at the applicable contract unit price per ton for "Riprap, 400-Lb Topsize", "Riprap, 90-Lb Topsize", and "Crushed Stone Bedding Material", which prices and payments shall constitute full compensation for all costs of furnishing, hauling, handling, placing and maintaining the riprap and crushed stone bedding material as specified.

1.14 ESTABLISHMENT OF TURF. Payment for establishment of turf will be made at the contract lump sum price for "Establishment of Turf," which price and payment shall constitute full compensation for furnishing all plant, labor, materials, and equipment, necessary to complete the work specified herein.

1.15 CHAIN-LINK FENCE. Payment for chain-link fence will be made at the contract lump sum price for "Chain-Link Fence," which price and payment shall constitute full compensation for furnishing all plant, labor, materials, and equipment, necessary to complete the work specified herein.

1.16 AGGREGATE BASE COURSE.

1.16.1 Measurement. The aggregate base course will be measured for payment by the ton (2,000 pounds) as specified in paragraph 1.13.1 above.

1.16.2 Payment. Payment for the aggregate base course will be made at the contract unit price per ton for "Aggregate Base Course", which price and payment shall constitute full compensation for all materials, labor, and equipment required to provide the base course as specified.

1.17 ASPHALTIC CONCRETE SURFACE.

1.17.1 Measurement. Measurement for asphaltic concrete surface will be made by the square yard. No measurement will be made of area paved beyond limits shown on the drawings unless additional pavement is directed by the Contracting Officer.

1.17.2 Payment. Payment for the asphaltic concrete surface will be made at the contract unit price per square yard for "Asphaltic Concrete Surface", which price and payment shall constitute full compensation for the costs of all plant, labor, materials and equipment, and performing all operations required to furnish and install the prime coat, geotextile, and asphaltic concrete surface.

1.18 CORRUGATED STEEL PIPE CULVERTS.

1.18.1 Measurement. Corrugated steel pipe culverts, excluding end sections, will be measured for payment by the linear foot along the centerline of the pipe.

1.18.2 Payment. Payment for corrugated steel pipe culverts, including excavation, trenching, backfilling, granular backfill, all standard and special joints and fittings, extensions and shoring as specified herein will be made at the applicable contract unit price per linear foot for "Corrugated Steel Pipe Culvert, 48-Inch Diameter" and "Corrugated Steel Pipe Culvert, 60-Inch Diameter".

1.19 CULVERT END SECTIONS. The steel end sections for the corrugated steel pipe will be paid for at the applicable contract unit price per each for "Metal End Sections for 48-Inch Diameter Culvert" and "Metal End Sections for 60-Inch Diameter Culvert", which prices and payments shall constitute full compensation for furnishing and installing the end sections.

1.20 CONCRETE. Payment for concrete will be made at the contract lump sum price for "Concrete”, which price and payment shall constitute full compensation for furnishing all plant, labor, materials, and equipment, necessary to complete the work specified herein and as shown on the drawings.

1.21 WATERSTOPS. Payment for waterstops will be made at the contract lump sum price for "Waterstops", which price and payment shall constitute full compensation for the cost of all labor, materials, equipment and tools required to complete the waterstop work.

1.22 REINFORCEMENT STEEL. Payment for the reinforcing bars in concrete will be made at the contract lump sum price for "Reinforcement Steel", which price and payment shall constitute full compensation for the costs of all materials, labor, and equipment required to furnish and install the reinforcing steel and accessories.

1.23 ADDITIONAL REINFORCEMENT STEEL.

1.23.1 Measurement. Additional reinforcement steel will be measured for payment by the pound.

1.23.2 Payment. Payment for additional reinforcement steel required in the concrete backfill will be made at the applicable contract unit price per pound for "Additional Reinforcement Steel:" subdivided items, which prices and payments shall constitute full compensation for the costs of all plant, labor, materials and equipment required to furnish and install the additional reinforcement steel in the concrete backfill.

1.24 OUTLET WORKS. All other concrete, and incidental items placed in the outlet works will be paid for at the contract lump sum price for "Outlet Works", which price and payment shall constitute full compensation for the cost of all plant, labor, materials and equipment required to furnish and place the concrete, including reinforcement steel, formwork, miscellaneous metals, and the prestressed concrete pressure pipe.

1.25 ROCK ANCHORS. Payment for rock anchors will be made at the contract unit price per each for "Rock Anchors", which price and payment shall constitute full compensation for the cost of furnishing all materials, labor, tools, equipment, and incidentals necessary for complete installation of rock anchors, including drilling, water testing of hole, waterproofing, grouting and cleanup of the area and disposal of waste water and grout.

1.26 SPILLWAY ROCK DRAINS. Payment for all materials, labor, and equipment required to complete the drains, as specified herein and shown on the drawings, will be made at the contract unit price per each for "Spillway Rock Drains".

1.27 JOINT BOLT GROUPS. Payment for the 2 bolt groups and instrument tags, punching all joint bolts, and providing the initial readings shall be made at the contract lump sum price for "Joint Bolt Groups", which price shall constitute full compensation for all costs of labor, materials, and equipment required for complete installation and measurement of the joint bolt system.

1.28 MOVEMENT MONUMENTS. Payment for furnishing and installing and providing initial elevations of the 5 movement monuments shall be made at the contract lump sum price for "Movement Monuments", which price shall constitute full compensation for all costs of labor, materials, and equipment required for complete installation and reading of the monuments.

1.29 BENCHMARK MONUMENT. Payment for furnishing, installing and providing initial readings for the benchmark monument shall be made at the contract lump sum price for "Benchmark Monuments", which price and payment shall constitute full compensation for all costs of labor, materials, and equipment required for complete installation and measuring of the monument.

1.30 ACCESS ROAD EMBANKMENT. Payment for the access road embankment will be made at the contract lump sum price for "Access Road Embankment", which price and payment shall constitute full compensation for the cost of all labor, materials, equipment and tools required to complete the access road embankment work.

1.31 MECHANICALLY STABILIZED EARTH WALLS. Payment for mechanically stabilized earth walls as specified in SECTION 02271, excluding stripping and excavation as specified in SECTION 02110 and rock excavation as specified in SECTION 02225, will be paid at the contract lump sum price for "Mechanically Stabilized Earth Walls," which price and payment shall constitute full compensation for providing all plant, labor, materials and equipment and

performing all operations necessary to complete the work as shown on the drawings and as specified.

INTERCEPTOR SEWER

NOTE: Mobilization, Demobilization, Clearing and Grubbing for the interceptor sewer will be paid as being incidental to the bid item to which it is most closely associated.

1.32 ROCK EXCAVATION, INTERCEPTOR SEWER.

1.32.1 Measurement. Rock excavation will be measured for payment by the cubic yard as specified in paragraph 1.4.1 above.

1.32.2 Payment. Payment for rock excavation will be made at the applicable contract unit price per cubic yard for "Rock Excavation, Interceptor Sewer:" subdivided items, which prices and payments shall constitute full compensation for the costs of all plant, labor, materials, and equipment required for drilling, blasting, ripping, excavating, loading, hauling, removing, and disposing of excavated rock and scaling of rock slopes.

1.33 GRAVITY SEWER PIPE

1.33.1 Measurement. Gravity Sewer pipe will be measured for payment by the linear foot on a horizontal plane after installation, through all line manholes, to the centers of new manholes, and through the walls of structures and existing manholes at the points of connection therewith. Sewer pipe in tunneled or jacked highway or street crossings will not be measured separately and shall be included in the unit prices for the tunneled crossings. No separate payment shall be make in connection with seeding as specified or required. All costs in connection with seeding shall be included in the cost of sewer pipe installation. Seeding shall be as specified in SECTION 02930.

1.33.2 Payment. Payment for gravity sewer pipe including excavation, trenching, backfilling, all standard and special joints and fittings, shoring and all other items incidental to the respective bid items will be made at the contract unit price per linear foot for " 21" Gravity Sewer Pipe" or " 20" Gravity Sewer Pipe."

1.34 MANHOLES. Manholes will be paid for at the applicable contract unit price per each for "Standard Manhole (6'deep)." The depth of the manhole will be measured from the elevation of the invert of the sewer line at the center of the manhole to the top of the manhole cover. This price shall include the manhole foundation, manhole invert construction, walls, top section, manhole frame and cover, and necessary ladder steps for a manhole 6 feet deep.

For manholes over six feet deep, each foot in excess of the six feet will be paid for at the contract unit price for "Additional Manhole Depth." The unit price shall cover the entire cost of each additional foot of vertical manhole depth in excess of 6 feet, including the prorated cost of ladder steps.

1.35 SPECIAL MANHOLES. Payment for special manholes shall be paid for at the applicable contract unit price per each for "Special Manholes". The depth of the manhole will be measured from the elevation of the invert of the sewer line at the center of the manhole to the top of the manhole cover. This price shall include the manhole foundation, manhole invert construction, walls, top section, manhole frame and cover, and necessary ladder steps for a manhole 6 feet deep. The cost of each special manhole shall include all items required to make the manholes watertight.

1.36 HIGHWAY CROSSINGS. Each crossing shall be measured for payment

horizontally along the longitudinal centerline of the enclosing conduit or pipe installed therein, from end to end of the enclosing conduit, or from end to end of the tunnel excavation where an enclosing conduit is not required. The unit price bid for each crossing in casing pipe shall include all costs in connection with excavation and backfilling, casing pipe, sewer pipe, al l skids, jointing materials, jacking pipe, jacking pits, sand backfill, end closures, and all other work for and in connection with the crossing, not paid for separately. Any disturbed asphalt or other payment will be replaced to the extent it existed or was intended to exist prior to making the crossing. No separate payment for asphalt removal or replacement will be made. Payment will be made at the contract unit price for "Tunneled Highway Crossings at Sta. 11+50," "Open Trench Highway Crossings at Sta. 22+50" and "Open Trench Highway Crossings at Sta. 28+70."

1.37 LACROIX CREEK CROSSINGS. The concrete total encasement shall be computed using the maximum allowable trench width (or pipe OD plus 24 inches where no maximum is specified), the minimum clear depth below the pipe, and the minimum cover over the pipe as indicated in the drawings, less the volume occupied by the pipe itself multiplied by the horizontally measured length of the encasement. Concrete for the La Croix Crossings will be paid at the contract unit price per cubic yard for "80' Concrete Encasement Sta 6+65," "40' Concrete Encasement Sta 29+20," "50' Concrete Encasement Sta 68+00," and "50' Concrete Encasement Sta 86+60."

1.38 MISCELLANEOUS CONCRETE. Concrete for encasement or blocking of pipe and fittings, not included as parts of manholes and other structures, will be measured for payment as the actual volume of concrete placed within the limits as indicated or specified. Concrete for encasement or blocking of pipe and fittings, not included as parts of manholes and other structures, will be measured for payment as the actual volume of concrete placed within the limits as indicated or specified.

Concrete for arch encasement of pipe shall be computed using the dimen sions shown for arch encasement on Figure 1 -02222 "Embedments for Conduits".

Unless otherwise authorized by Contracting Officer, all additional concrete for encasement or blocking required outside the specified pay limits will be considered a subsidiary obligation of Contractor and no direct payment shall be made therefor.

All concrete which is required in connection with manholes or structures, pavement or sidewalk replacement, and other pay items shall be included in the lump sum or unit price bid for the pay item.

All concrete required for Class A Arch Encasement of vitrified clay pipe (VCP), if selected at Contractor's option, shall be included in the cost of 21-inch Gravity Sewer Pipe, and no separate payment shall be made.

All concrete required for Class A Arch Encasement of vitrified clay pipe (VCP), if selected at Contractor's option, shall be included in the cost of 21-inch Gravity Sewer Pipe, and no separate payment shall be made.

All miscellaneous concrete for the interceptor sewer will be paid at the contract unit price per cubic yard for "Miscellaneous Concrete."

1.39 CONNECTIONS TO EXISTING FACILITIES. Connections to existing manholes and sewers shall be paid for separately at the lump sum prices bid. Such payment shall be full compensation for necessary cutting, shaping, plugging, reshaping of existing invert, diversion of flow, completing the connection as required, and excavation work not otherwise paid for as trenching. Payment for connections to existing service will be made at the

contract lump sum prices for “Connections to Existing Facilities (POT Sta 99+52.51)” and “Connections to Existing Facilities(Sta 0+00).”

1.40 RESTORATION.

1.40.1 Measurement. Pavement removal and replacement and gravel replacement will be measured for payment horizontally along the centerline of the pipe, through manholes, and to the edge of the existing pavement and/or gravel, or, where the edge of the existing pavement or gravel is not clearly defined, to the edge of the replacement area. The width of pavement and gravel replacement will not be measured or taken into account in payment.

1.40.2 Payment. Payment for the work associated with pavement and gravel replacement shall be made at the contract unit price per linear foot for “Restoration”, which price and payment shall constitute full compensation for pavement removal and replacement and gravel replacement and for all costs of labor, materials, and equipment required to complete the work as specified in the applicable parts of SECTIONS 02512 and 02546 and as shown on the drawings.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

-- END OF SECTION 01025 --

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SUBMITTAL REGISTER
(ER 415-1-10)

CONTRACT NO.

CAPE GIRARDEAU DETENTION RESERVOIR

CONTRACTOR

SPECIFICATION SECTION

					TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.
			02110-1.3	Plan of Operation					x							x										
			02140-1.4.1	Dewatering and Care of Water Plan					x							x										
			02270-1.4.4	Geotextile Material							x				x											
			02270-1.4.1	Source of Stone					x							x										
			02270-1.4.2	Gradation Test Data	x										x											
			02270-1.4.3	Method of Placement					x						x											
			02271-1.4.1	Backfill Material Compliance							x					x										
			02271-1.4.2	Mechanically Stabilized Walls	x										x											
			02271-1.4.3	Joint Filler and Cover	x											x										
			02271-1.4.4	Water Repellent Data	x											x										
			02271-1.4.5	Wall Panel Insurance					x						x											
			02271-1.4.6	Mechanically Stabilized Walls		x										x										
			02271-1.4.7	Concrete Mix Proportions						x						x										
			02271-1.4.8	Compliance Tests						x					x											
			02271-1.4.9	Material Samples								x				x										
			02271-1.4.10	Drainage Plan					x							x										
			02270-1.4.4	Geotextile Material							x				x											
			02500-1.4.1	Asphalt	x										x											
			02520-1.4.1	Asphalt Roof Cement	x											x										
			02520-1.4.2	Construction Plan		x										x										
			02520-1.4.2	Installation Details		x										x										
			02520-1.4.3	Prestressed Concrete Pressure Pipe						x						x										
			02605-1.3	Steel Reinforced Plastic Manhole	x										x											

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a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.
			02612-1.3	Prestressed Concrete Pipe Data	x										x											
			02618-1.3.1	Reinforced Concrete Pipe	x										x											
			02620-1.2.1	Certification for Pipe, Fittings, Access.							x				x											
			02620-1.2.2	Gasket Certification							x				x											
			02620-1.2.3	Joint Proof of Design Certificate							x				x											
			02620-1.2.4	Welded-On Outlet Certificate							x				x											
			02620-1.2.5	Laying Schedule				x							x											
			02627-1.3.1	Joint Details	x										x											
			02627-1.3.2	Gasket Material Compliance	x										x											
			02627-1.3.3	Pipe Length Data	x										x											
			02627-1.3.4	Compliance Certificates							x				x											
			02628-1.2.1	Joint Details	x										x											
			02628-1.2.2	Gasket Material Compliance	x										x											
			02628-1.2.3	Pipe Length Data	x										x											
			02628-1.2.4	Compliance Certificates							x				x											
			02200-1.3.1	Material Data	x										x											
			02720-1.4.1	Guardrail Data	x										x											
			02720-1.4.2	Steel Pipe Culverts	x										x											
			02830-1.3.1	Chain-Link Fence		x									x											
			02830-1.3.2	Chain-Link Fence							x				x											

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ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.
			03101-1.3.1	Concrete Form Materials	x										x											
			03101-1.3.2	Formwork		x									x											
			03101-1.3.3	Reshoring					x						x											
			03101-1,3,4	Inspection						x					x											
			03150-1.2.1	Waterstops					x						x											
			03150-1.2.2	Expansion Joint Filler Strips						x					x											
			03150-1.2.3	Sealants and Primer								x			x											
			03150-1.2.3	Waterstops								x			x											
			03210-1.2.1	Fabrication and Placement		x										x										
			03210-1.2.2	Tests and Inspections						x					x											
			03210-1.2.3	Materials									x		x											
			03301-1.6.1.1	Concrete Mixture Proportions						x					x											
			03301-1.6.1.2	Cement						x					x											
			03301-1.6.1.3	Nonshrink Grout						x					x											
			03301-1.6.2.1	Air-Entraining Admixture							x				x											
			03301-1.6.2.2	Other Chemical Admixtures							x				x											
			03301-1.6.2.3	Curing Compound							x				x											
			03301-1.6.3	Plant, Equipment and Methods	x										x											

SUBMITTAL REGISTER
(ER 415-1-10)

CONTRACT NO.

CAPE GIRARDEAU DETENTION RESERVOIR

CONTRACTOR

SPECIFICATION SECTION

					TYPE OF SUBMITTAL										CLASSI-FICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANS-MITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	O&M MANUALS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	REMARKS
a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.
			03310-1.3	Concrete Sewer	x										x											
			03500-1.4.1	Anchor Rods							x				x											
			03500-1.4.1	Cement							x				x											
			05101-1.5.1	Detail Drawings		x										x										
			05101-1.5.2.1	Materials Orders				x							x											
			05101-1.5.2.2	Materials List				x							x											
			05101-1.5.2.3	Shipping Bill				x							x											
			05101-1.5.3.1	Welding Procedures					x							x										
			05101-1.5.3.2	Welding Repairs					x							x										
			05101-1.5.4	Tests and Inspections						x					x											
			05101-1.5.5.1	Welder Qualifications							x				x											
			05101-1.5.5.2	Steel Stud Qualifications							x					x										
			05101-1.5.6	Materials Disposition Records									x		x											
			05502-1.2.1	Fabricated Metal Items		x										x										
			05502-1.2.2	Misc. Metals and Metal Articles				x								x										
			05502-1.2.3	Misc. Metals and Metal Articles						x						x										
			05502-1.2.4	Misc. Metals and Metal Articles								x				x										
			05502-1.2.5	Misc. Metals and Metal Articles									x			x										

SECTION 02100
CLEARING AND GRUBBING

INDEX

SECTION 02100
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SCOPE. The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations necessary for the clearing and grubbing of the areas specified herein or indicated on the drawings, for the removal and disposal of all cleared and grubbed materials, and for the filling of all holes caused by grubbing operations, as specified herein.

1.2 QUALITY CONTROL.

1.2.1 General The Contractor shall establish and maintain quality control for clearing and grubbing operations to assure compliance with contract requirements, and maintain records of its quality control for all construction operations including but not limited to the following:

(1) Clearing. Station to station limits, percentage of area complete; type of material.

(2) Grubbing. Station to station limits, percentage of area complete; type of material.

(3) Disposition of Cleared and Grubbed Materials. Method and location of disposition; damage to timber or improvements which are not to be cleared.

1.2.2 Reporting. A copy of these records of inspections and tests, as well as the records of corrective action taken, shall be furnished to the Government daily.

1.3 GENERAL REQUIREMENTS. Clearing and grubbing will be limited to the areas absolutely necessary for construction unless approved by the Contracting Officer. If regrowth of vegetation or trees occurs after clearing and grubbing and before placement of fill, the Contractor will be required to clear and grub the area again prior to backfilling and dam construction, and no payment will be made for this additional clearing and grubbing. The Contractor shall use care not to destroy any survey baseline during its clearing and grubbing operations.

PART 2 – PRODUCTS

2.1 CLEARING.

2.1.1 General. Clearing, unless otherwise specified, shall consist of the complete removal above the ground surface of all trees, stumps, down timber, snags, heavy brush, loose stone, existing channel revetment, fencing, tires, broken concrete blocks, bricks and similar debris.

2.1.2 Merchantable Timber. Merchantable timber remaining within the areas to be cleared on or after the date of award of this contract may be disposed of as the Contractor sees fit, as long as such merchantable timber is either removed from the right-of-way indicated on the drawings or is satisfactorily disposed of in accordance with the provisions of Paragraph 3.6.

2.1.3 Vegetation. Close-growing vegetation to be removed shall consist of crops, grass, bushes and weeds. Close-growing grass and other vegetation

shall be considered “stripping”. See specification SECTION 02110 for stripping requirements..

2.2 GRUBBING.

2.2.1 General. Grubbing shall consist of the removal of all stumps, roots, buried logs, old piling, old paving, old foundations, pipes, drains, and other unsuitable material as described in Paragraph 3.2.

2.3 REMOVAL OF IMPROVEMENTS.

2.3.1 General. The work consists of the removal and disposal of all existing improvements, except those designated to be removed by others, from within the limits of the new work specified in this contract. Removal of improvements shall include, but are not necessarily limited to the removal of asphaltic concrete and crushed stone. Removed materials shall be disposed of as specified in Paragraph 3.6.4.

PART 3 – EXECUTION

3.1 AREAS TO BE CLEARED. The entire area within the right-of-way limits to be occupied by the dam, spillway, channels, borrow area and access road shall be cleared

3.2 AREAS TO BE GRUBBED.

3.2.1 Embankment Dam Limits. Grubbing shall be performed within the slope limits of the embankments or other areas to be filled. All roots and other projections over 1-1/2 inches in diameter shall be removed to a depth of 3 feet below the natural surface of the ground.

3.2.2 Channels and Ditches. All stumps and exposed roots and other obstructions shall be removed from within the limits of the dam construction.

3.3 PIPES AND DRAINS. The Contractor shall inform the Contracting Officer of all pipes and drains not shown on the drawings which are encountered during grubbing. Such pipes and drains shall not be removed or disturbed until so directed by the Contracting Officer. Material excavated in the process of removing pipes and drains shall be disposed of as specified in SECTION 02110 – STRIPPING AND EXCAVATION.

3.4 FILLING OF HOLES. All holes caused by grubbing operations and removal of pipes and drains shall be backfilled with suitable material in 6-inch layers to the elevation of the adjacent ground surface, and each layer compacted to a density at least equal to that of the adjoining undisturbed material or as directed by the Contracting Officer.

3.5 REMOVAL OF IMPROVEMENTS.

3.5.1 Road. Areas of asphaltic and crushed stone pavements to be removed are between Weston Street and the Industrial Court property line as shown on the drawings. In removing asphaltic concrete pavements, a joint shall be sawed a minimum of three inches in depth with a true line or with a smooth curve as required and vertical face. Sufficient removal shall be made to provide for the specified grades, cross-sections and connections to new work and existing pavements as indicated on the drawings. The asphaltic concrete pavements shall be disposed of as specified in Paragraph 3.6.1. Areas of existing crushed stone parking areas or roads that are to be

abandoned are to be scarified to the depth of 4 inches with approved equipment. Abandoned scarified surface shall be covered with a 12-inch layer of vegetation removal material, or other earth material as directed by the Contracting Officer. The material shall be placed so that the finished surface blends with the adjacent ground surface. The only compaction required shall be that obtained by the necessary spreading and dumping operations, except the equipment shall be so operated that the tracks are distributed evenly over the entire surface of the fill.

3.6 DISPOSAL OF DEBRIS.

3.6.1 General. All debris resulting from clearing and grubbing operations shall be disposed of either by burning, chipping, or removal from the site. The material resulting from the stripping of close-growing vegetation shall be disposed of in the borrow area. Only excess stripped materials, earth materials, and excavated rock materials shall be disposed in the borrow area. This material shall be covered with a uniform minimum 6-inch layer of excess stripped materials after placement and shall be graded uniformly to the satisfaction of the Contracting Officer. Excavated rock materials shall similarly be covered except the minimum thickness shall be 12-inches.

3.6.2 Removal from Site of Work. The debris shall be hauled to the nearest state approved landfill or disposal site. Such disposal shall comply with all applicable Federal, State, and local laws. The Contractor shall, at its option, either retain for its own use or dispose of by sale or otherwise, any such materials of value. The Government is not responsible for the protection and safekeeping of any materials retained by the Contractor. Such materials shall be removed from the site of the work before the date of completion of the work. If debris from clearing operations is placed on adjacent property, the Contractor shall obtain without cost to the Government, additional rights-of-way for such purposes. Such material shall be so placed as not to interfere with roads, drainage or other improvements and in such a manner as to eliminate the possibility of its entering into channels, ditches, or streams. The Contractor shall submit written evidence to the Contracting Officer that permission for disposal of material on the owner's property has been obtained from the property owner. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the property rights and access thereto, prepared and executed in accordance with the laws of the State of Missouri. If temporary rights are obtained by the Contractor, then the period of time shall coincide with the Contract Clause entitled COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK. However, delays resulting from acquisition of additional rights-of-way for alternate disposal areas will not qualify as excusable delays if suitable disposal areas are available. Removals shall include all materials that are cleared, grubbed, or excavated from this project including materials retained by the Contractor for its own use and materials sold or otherwise used by others.

3.6.3 Removal from Site of Work. The Contractor may elect to remove all or part of the debris from the site of the work. Such disposal shall comply with all applicable Federal, State, and Local laws. The Contractor shall, at its option, either retain for its own use or dispose of by sale or otherwise, any such materials of value. The Government will not be responsible for the protection and safekeeping of any materials retained by the Contractor. Such materials shall be removed from the site of the work before the date of completion of the work. If debris from clearing operations is placed on adjacent property, the Contractor shall obtain without cost to the Government, additional right-of-way for such purposes. Such material shall be so placed

as not to interfere with roads, drainage or other improvements and in such a manner as to eliminate the possibility of its entering into channels, ditches, or streams. The Contractor shall submit written evidence to the Contracting Officer that permission for disposal of material on the owner's property has been obtained from the property owner. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the property rights and access thereto, prepared and executed in accordance with the laws of the State of Missouri. If temporary rights are obtained by the Contractor, then the period of time shall coincide with 00800-1 hereof. However, delays resulting from acquisition of additional rights-of-way for alternate disposal areas will not qualify as excusable delays if suitable Government furnished disposal areas are available. The Contractor shall obtain a "Special Disposal Site Permit" from the City of Cape Girardeau Division of Planning Services before placing any materials on any sites other than the designated Disposal Areas shown on the drawings. This requirement shall include all materials that are cleared, grubbed, or excavated from this project including materials retained by the Contractor for its own use and materials sold or otherwise used by others.

3.6.4 Removal of Abandoned Drainage Structures. Drainage structures, including all pipes and drains designated as salvageable by the Contracting Officer, and which are to be removed from within the designated limits of work will not become the property of the Contractor, but shall be removed by the Contractor from within the limits of rights-of-way, and hauled to locations designated by the Contracting Officer. All CMP pipes which are to be removed from within the designated limits of work shall become the property of the Contractor. Removal operations shall be conducted in such a manner that material designated to be salvaged will not be damaged.

3.6.5 Burning. The Contractor shall comply with all applicable State and local air pollution restrictions. Subject to such restrictions and obtaining any required permit from the Missouri Environmental Protection Agency or any other permit which may be required by said State or local authority, the Contractor may burn material within the contract area, and at any time within the contract period provided such burning does not cause the above standards to be exceeded or does not interfere with inhabitants of the area by drastic changes in their accustomed environment, such as addition to air pollution or danger of fire. Such burning will require the use of an "air curtain" type incinerator. However, the specific time, location, and manner of burning concerning air pollution, governing fire laws, and safety, shall be subject to the approval of the Contracting Officer. Burning operations shall not be conducted within 200 feet of any standing timber or other flammable growth. The Contractor shall be responsible for any damage to life and/or property resulting from fires that are started by its employees as a result of contract operations. The Contractor shall furnish, at the site of burning operations, adequate fire fighting equipment to properly equip personnel for fighting fires. Fires shall be guarded at all times and shall be under constant attendance, day and night until they have burned out or have been extinguished. All burning shall be so thorough that the materials will be reduced to ashes. After burning operations are complete, the Contractor shall restore the area in a manner satisfactory to the Contracting Officer.

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SECTION 02110
STRIPPING AND EXCAVATION

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SECTION 02110 - STRIPPING AND EXCAVATION

PART 1 GENERAL

1.1 SCOPE. This section covers all operations in connection with stripping and excavation, as specified herein and shown on the drawings. Excavation and fill shall be performed within the limit lines and grades shown on the drawings and defined herein, however the Government reserves the right to modify such limits and grades as may be determined necessary by the Contracting Officer.

1.1.1 Related Work Specified Elsewhere.

1.1.2 Embankment. Embankment and foundation preparation are specified in SECTION 02220 – EMBANKMENT.

1.1.3 Rock Excavation. Rock excavation and concrete backfill are specified in SECTION 02225 - ROCK EXCAVATION.

1.1.4 Mechanically Stabilized Earth Wall. Foundation preparation is specified in SECTION 02271 – MECHANICALLY STABILIZED EARTH WALLS.

1.2. QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of its quality control for all construction operations, including but not limited to the following:

(1) Stripping and excavation (lines and grades).

(2) Grading disposal areas.

(3) Foundation cleanup.

(4) Disposition of materials.

(5) Drainage of borrow areas.

1.2.2 Reporting. A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government daily.

1.3. GENERAL. All operations specified in this section shall be performed in accordance with a plan of operations submitted by the Contractor and approved by the Contracting Officer. Government approval is required for submittals with a “GA” designation; submittals having an “FIO” designation are for information only. Submittals shall be in accordance with SECTION 01300 – SUBMITTAL PROCEDURES. Excavation of the materials for use in the construction of the embankment shall be so conducted as to segregate materials of different character in accordance with their suitability for placement in the various parts of the work, or stockpiled prior to such use. The right-of-way and earth materials for constructing the work will be furnished without cost to the Contractor at the locations shown on the drawings. Control of water shall be as specified in SECTION 02140 - CONSTRUCTION DEWATERING AND CARE OF WATER.

PART 2 NOT APPLICABLE

PART 3 EXECUTION

PART 3.1 STRIPPING

3.1.1. GENERAL. Stripping shall consist of close-growing vegetation consisting of crops, grass, bushes and weeds. The entire surface of the dam embankment, spillway, outlet works, cofferdam foundations, utilized portions of the borrow areas, and areas of required excavation designated as sources of suitable material on the drawings, or by the Contracting Officer, shall be stripped to the depths shown, noted, or as directed. Also included is the area below the proposed access road north of the industrial court property line including the access road to the dam. Material obtained from the stripping operations may be used in the Contractor's haul roads and facilities. Sufficient stripped material suitable for use as "Topsoil," at those locations as indicated on the drawings or as determined by the Contracting Officer, shall be stockpiled for later use. Topsoil shall be considered to be any material with sufficient organic content to be suitable for establishing desirable ground cover but is considered unsuitable for embankment. Any excess stripped topsoil shall be redistributed over disturbed areas including but not limited to borrow areas and areas which have received embankment as directed by the Contracting Officer.

3.2. EARTH EXCAVATION.

3.2.1 General. Earth excavation comprises and includes overburden excavation and borrow excavation. Excavation shall consist of the removal of all material to the lines and grades indicated, specified, or directed. Material required for the Contractor's construction of haul roads and facilities may be obtained from excavated materials required to be wasted, and no other source of material from Government-owned lands will be provided.

3.2.2 Slides. In the event a slide occurs in an excavated area, the Contractor shall perform the necessary repair as directed. If the Contracting Officer determines that the slide was due to negligence of the Contractor, no additional payment will be made for the repair. If the Contracting Officer determines that the slide was not due to negligence of the Contractor, the Contracting Officer will order, in writing, that necessary repairs be made and such additional work will be paid for at the applicable contract price for the excavation required.

3.2.3 Over-Excavation. Unauthorized over-excavation shall be at the Contractor's expense; authorized over excavation will be paid for at the applicable contract price for the material excavated. The Contracting Officer will determine which over-excavations are to be backfilled, and such over-excavations shall be backfilled to grade with appropriate materials in accordance with the provisions of SECTION 02220 - EMBANKMENT. Backfill for authorized over-excavation will be paid for at the applicable contract price for the material used. Backfill of unauthorized over-excavation shall be at the Contractor's expense.

3.2.4 Overburden Excavation. Overburden excavation shall comprise and include the removal and disposal of all earth, sand, clay, gravel, boulders and slump blocks (not large enough to be classified as rock), and compacted impervious fill materials specified for removal as can be readily excavated by ordinary earth moving equipment. Overburden excavation shall consist of all material, as defined above, to be excavated for all the permanent work and work incidental thereto, except material specified otherwise herein, shown on the drawings, or determined by the Contracting Officer to fall in other

classifications.

3.2.5 Reserved.

3.2.6 Borrow Excavation. Borrow Excavation shall comprise and include the removal and disposal of all material excavated from the borrow areas and satisfactorily used in the permanent work, except stripping which shall be accomplished as specified in Paragraph 3.1.1. All suitable materials designated for removal in the required excavations shall be utilized to the fullest extent before the borrow area is utilized. The depths of all cuts and side slopes of the borrow areas shall be as shown on the drawings. The Contractor will be required to submit a detailed written plan indicating the extent and sequence of borrow area utilization 30 days prior to the start of construction of any portion of the permanent fill.

3.2.7 Disposition of Materials.

3.2.7.1 Overburden Excavation. Suitable material from overburden excavation, as determined by the Contracting Officer, shall be placed in the embankment fill. The portion of the overburden excavation considered unsuitable for embankment fill shall be disposed of in the borrow area (after borrow materials are excavated), or as directed by the Contracting Officer.

3.2.7.2 Borrow Excavation. Except for stripped materials, suitable borrow excavation shall be placed in the excavated cut-off trenches and the compacted embankment fill, as specified herein, shown, or directed. Unsuitable borrow material shall be disposed of as specified in SECTION 02220 - EMBANKMENT.

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SECTION 02140
CONSTRUCTION DEWATERING AND/OR CARE OF WATER

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SECTION 02140
CONSTRUCTION DEWATERING AND/OR CARE OF WATER

PART 1 – GENERAL

1.1 SCOPE. The work provided for herein consists of furnishing all plant, labor, materials, and equipment and performing all design, construction, installation, and operations required for dewatering and care of water in and adjacent to the inspection/cutoff trench, cofferdammed areas, outlet pipe and spillway areas and all other work incidental thereto as indicated on the drawings, specified herein, and as otherwise required.

1.2 QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of its quality control for all operations, including but not limited to the following:

(1) Installation, operation, and removal.

(2) Monitoring free water surface and piezometric evaluations.

(3) Measuring effluent from dewatering system.

(4) Monitoring of sanding.

1.2.2 Reporting. A copy of these records and tests, as well as the records of corrective action taken will be furnished to the Government daily. Reports of operation and inspection shall include detailed data for wells, wellpoints, piezometers, effluent discharge, and other related items.

1.3 GENERAL. All work specified under this contract shall be accomplished in areas free of water. Where necessary, the Contractor shall design and install a system including such wells and/or well points, ditches, dikes, sumps, collectors, drains, pumps, etc., as may be required to meet and maintain all conditions and requirements as established herein; and shall provide and operate the system, inclusive of adequate plant and standby equipment, so as to maintain the areas for work under this contract in a fully dewatered condition. The structures and work which shall be constructed or performed in a dewatered condition include but are not limited to:

(1) The embankment dam, spillway, and cutoff trench.

(2) The outlet structure.

(3) The spillway structure and stilling basin.

(4) The abutments.

(5) The grading and shaping of all embankments, excavations and slopes associated with construction.

(6) The toe drain.

1.3.1 Definitions. “Dewatering” as defined for the purposes of this contract, is the lowering of the piezometric surface at least five feet below the bottom of any excavation, and at least five feet below the side slopes and

other excavation surfaces. “Care of Water” as defined for the purposes of this contract, consists of the collection, control, removal and disposal of all surface water within the excavation and working areas regardless of the source. This includes providing adequate measures to prevent erosion of the foundation and erosion of the excavation slopes.

1.4 SUBMITTALS. Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01300 SUBMITTAL PROCEDURES:

1.4.1 Dewatering System and Care of Water Plan. GA. Within 14 calendar days after receipt of Notice to Proceed, the Contractor shall submit a dewatering and/or care of water plan to the Contracting Officer for approval. Each submittal shall include, but not be limited to:

(1) Assumptions, design calculations, and areas for dewatering and/or care of water.

(2) The type of system chosen that is in accordance with Paragraph 02140-1.3.

(3) Plan for monitoring groundwater.

(4) Emergency rewatering plan.

Approval of the dewatering and/or care of water plan, either as submitted or revised as a result of Government review, shall not be interpreted as the Government accepting responsibility for the performance of this plan, and shall not relieve the Contractor of full responsibility for the proper design, installation, maintenance, operation, and performance of the entire system. After approval for installation, the Contractor shall make no alteration to the planned system without the prior written approval of the Contracting Officer.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 DEWATERING REQUIREMENTS.

3.1.1 General. The dewatering systems shall be of sufficient size and capacity to provide the specified dewatering conditions for the satisfactory placement of impervious fill, pervious fill, concrete, all rock excavation, foundation cleanup for inspection, final foundation preparation and all grouting within the area of the outlet pipe and spillway area, and all other work required to be accomplished in the dry. All dewatering shall be accomplished by a positive system capable of intercepting any water before it exits on a excavation face. The Contractor will be required to perform such dewatering and maintain the work area in a dry condition as long as is necessary to satisfactorily complete the item of work being protected. Only during flood emergencies as set forth in Paragraph 3.2 will these dewatering requirements be lifted. Any damage to the foundation or permanent work caused by temporary or permanent failure of the dewatering system shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense.

3.1.2 The systems shall be of such capacity as will lower the free water and piezometric levels to and maintain said levels at least 5 feet lower in elevation than any and all earth slopes and excavation surfaces lying

within the cofferdammed areas and the inspection/cutoff trench, inclusive of the interior slopes of the cofferdam embankments.

3.1.3 After the water table has been lowered to or below the elevations defined in Paragraph 3.1.2 above, it shall be maintained at or below these elevations continuously, so as to allow construction operations to proceed without interruption due to wet conditions.

3.1.4 No upward, vertical, or lateral flow of water into the dewatered area will be permitted at any time. The dewatering system shall be designed, constructed, and operated at all times, including unwatering, rewatering, and/or flooding so as to prevent disturbance of the foundation by movement, loosening and/or piping of the material, excavation slopes, and fill materials. The system shall operate during dewatering, flooding, and rewatering so as to maintain piezometric heads within the cofferdam at levels beneath the elevation of the immediately overlying earth surface plus the height of water, if any, standing above the earth surface at this point.

3.1.5 Rewatering and/or flooding of the dewatered area shall be accomplished by directing surface water into the area. The dewatering system shall be kept operating at full capacity during such conditions, with dewatering effluent being directed into the excavation. Protection of slopes and excavation surfaces will be required to prevent erosion during flooding operations. No upward, vertical, or lateral flow of water into the excavations from the foundation slopes will be permitted.

3.1.6 Ditches, sumps, sump pumps, and discharge piping shall be provided for control of surface water, rain water, and any water from Contractor's operations. Protection of all slopes, including the placement of filter cloth if necessary, will be required to prevent erosion under normal surface runoff and construction conditions.

3.1.7 A system of piezometers will be required to monitor free water surface and piezometric elevations to evaluate effectiveness of the dewatering system in fulfilling the requirements outlined herein. Piezometers shall be of adequate numbers and in suitable arrangements and depths for determining the free water surface and piezometric elevation over the area enclosed by the dewatering system. The Contractor shall make a minimum of one reading per piezometer, per 24-hour period, a minimum of 8 hours apart, based on a 7-day week. Said piezometer readings shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be so directed as to the number and time that these readings are required. No additional payment will be made for such additional readings.

3.1.8 The system shall include mechanical means for measuring (estimation is unacceptable) the effluent from each element of the dewatering system. Devices and technique used in measurement shall be acceptable to the Contracting Officer. The Contractor shall make a minimum of one reading per instrument, per 24-hour period, a minimum of 8 hours apart, based on a 7-day week. Said instrument readings shall be recorded on an approved form and reported to the Contracting Officer within 12 hours after they are obtained. If, in the opinion of the Contracting Officer, more frequent readings are required, the Contractor will be so directed as to the number and time that these readings are required. No additional payment will be made for such additional readings.

3.2 PLAN OF OPERATION. Design of the dewatering system shall include

all phases of the Contractor's proposed plan of operation of the system for all expected conditions including developing, testing, and proving of the installed system; normal operation; emergency flooding; and schedule of removal of the dewatering system.

3.3 DEWATERING SYSTEMS.

3.3.1 General. Dewatering systems may consist of, but not necessarily be limited to, the use of wells, wellpoints, compacted impervious cutoffs, slurry trenches, sheet piles, ditches, sumps, pumps, mops, and the like, provided required results as specified above are achieved. Only compacted impervious cutoffs constructed according to the provisions of SECTION 02220 for "Impervious Fill", and sheet piles shall be considered permanent types of installations and allowed to remain; all other dewatering systems shall be removed as specified in Paragraph 3.7. The Contractor shall provide at least one complete spare pumping unit for every five pumping units employed in the system, but in no case shall less than one spare pumping unit be provided. The Contractor shall also provide standby power equipment. The amount of standby equipment will depend on the type and source of power used to operate pumps, and shall be subject to approval of the Contracting Officer.

3.4 INITIAL TESTING. Upon installation of the system, the Contractor shall test and evaluate the completed system to demonstrate to the satisfaction of the Contracting Officer that the system is, in fact, capable of performing the intended dewatering operation as outlined herein. This testing shall include complete falling head tests to be conducted on each piezometer.

3.5 OPERATION. The Contractor will be required to perform such dewatering and to maintain the work areas in a dry condition as long as is necessary for the work under this contract. Once an area is dewatered, it shall be maintained in a dewatered condition until all work is completed, unless flooding is directed by the Contracting Officer. In the event that overtopping of the cofferdam from flooding takes place, no compensation will be made by the Government for costs incurred as a result of flooding except as provided in 00800-9. Compensation by the Government will be limited to repairs to the cofferdam, dewatering system, and/or any part of the permanent work ordered by the Contracting Officer pursuant to 00800-9. Commencement of unwatering subsequent to flooding shall take place within 24 hours after the flooding event and shall be completed with 3 days.

3.6 MAINTENANCE AND SERVICING. The Contractor shall be responsible for the maintenance, servicing, and repairs of the entire dewatering system and appurtenances during the life of the contract, including replacement of any and all wells found performing unsatisfactorily.

3.7 REMOVAL. The dewatering facilities required to maintain a dry condition within the protected area shall be maintained until completion of the work within the protected area, and then shall be completely removed. However, no dewatering facilities of any kind shall be removed without prior approval of the Contracting Officer. All wells and/or well points, pumps, and appurtenances employed in the dewatering system and all materials other than earth shall remain the property of the Contractor, and shall be removed from the site of the work. All holes, voids, cavities, etc ., created through installation, operation, and/or removal of the dewatering system shall be completely filled with grout after removal of the system.

3.8 REVIEW OF SYSTEM DESIGN AND PERFORMANCE. The Contractor shall submit to the Contracting Officer, for review and approval, details of the

proposed dewatering facilities, including the type of system; planned layout of wells and/or wellpoints; headers, including all lengths requiring burial; collectors; ditches; piezometers; sumps and pumps; capacities of pumps; nature and capacities of standby pumping and power supply facilities; number, type, location, proposed method of installation, and proposed methods of testing of piezometers; facilities for measuring the flow of water pumped from each element of the dewatering system; facilities and proposed schedule for monitoring of sanding; provisions for disposal of water from the dewatering system; and plan of operation as required in Paragraph 3.2. This submission shall include all assumptions and computations used in determination of the design capacity of the system and shall be submitted no later than 60 days prior to installation of the system. The Contracting Officer's review of the Contractor's proposed dewatering facilities and supporting design data will be for the purpose of determining (1) the acceptability of the general design concept and layout of the system; (2) the gross capacity of the system and corresponding calculated drawdowns within the area to be dewatered; and (3) the acceptability of the flooding and rewatering plans. The design and installation procedure of the individual components of the system need not be submitted for review as the performance of the complete system remains a responsibility of the Contractor. If the Contracting Officer determines, based on the above-mentioned review, that the system appears adequate to accomplish the required results, the system will be approved for installation. If the Contracting Officer's review determines that the Contractor's proposed dewatering facilities are either inadequate or inappropriate to accomplish the required results, the Contractor will be so notified in writing, and the basis for rejection will be included. Subsequent approval of the plan for installation, either as submitted or revised as a result of the review, shall not relieve the Contractor of full responsibility for the proper design, installation, maintenance, operation, and actual performance of both the individual system components and the entire system. After approval, the Contractor shall make no changes to the plan without the prior written approval of the Contracting Officer. If, during the progress of the work, the installed dewatering system proves inadequate to meet the requirements specified, including piezometers, the Contractor shall, at its own expense, furnish, install and operate such additional dewatering facilities and/or make such changes either in other features of the system or the plan of operation as may be necessary to perform the required dewatering in a satisfactory manner. Any damage to the foundation or permanent work resulting from inadequacy or failure of the dewatering system shall be repaired to the satisfaction of the Contracting Officer and at the Contractor's expense. Such changes must be approved in writing by the Contracting Officer prior to being made.

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DIVISION 2 – SITE WORK

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SECTION 02200
EARTHWORK, INTERCEPTOR SEWER

PART 1 - GENERAL

1.1 SCOPE. This section covers earthwork and shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary or required; protection of adjacent property; backfilling; pipe embedment; construction of fills and embankments; surfacing and grading; and other appurtenant work required to construct the interceptor sewer.

1.2 GENERAL.

Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Contracting Officer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

1.3 APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.3.1 American Society for Testing and Materials (ASTM).

ASTM D 698-91 (R 1998)	Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft3 (600 kN-m/m3))
ASTM D 4253-93 (R 1996)	Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D 4254-91 (R 1996)	Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

1.3.2 American Water Works Association (AWWA).

AWWA C 200-97	Steel Water Pipe – 6 in. (150 mm) and Larger

1.3.3 The Society for Protective Coatings (SSPC).

SSPC Paint 16-91	Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint

PART 2 - PRODUCTS

2.1 MATERIALS.

2.1.1. Smooth Steel Casing Pipe. Smooth-wall casing pipe shall be of welded steel construction conforming to AWWA C200 and shall be of new material with a minimum yield point of 35,000 psi. The pipe shall have a wall thickness of at least 0.250 inch where 30 inch and smaller casing pipe is indicated on the drawings. All 36 inch casing pipe shall have a minimum wall thickness of 0.312 inch. A minimum wall thickness of 0.375 inch shall be used for all 48 inch casing pipe. The casing pipe shall be cleaned and coated both inside and outside with two coats of coal tar paint conforming to SSPC Paint 16, black.

2.1.2. Casing Spacers. Casing spacers shall be used to install carrier pipe inside the encasement pipe. Casing spacers shall be projection type, totally non-metallic spacers constructed of preformed sections of high density polyethylene.

2.1.3. End Closure. Molded rubber end seal. Stainless steel bands with adjustable worm gear shall be provided for fastening the end seal to the pipe and casing.

2.1.4. Inundated Sand Fills. Sand shall be clean, with not more than 25 percent retained on a No. 4 sieve and not more than 7 percent passing a No. 200 sieve, and shall have an effective size between 0.10 and 0.30 mm.

2.1.5. Graded Gravel. Gravel for compacted backfill shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
1 inch	100
3/4 inch	85 - 100
3/8 inch	50 - 80
No. 4	35 - 60
No. 40	15 - 30
No. 200	5 - 10

The gravel mixture shall contain no clay lumps or organic matter. The fraction passing the No. 4 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.2 TESTS. As stipulated in the quality control section, all tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of the Contractor. Two initial gradation tests shall be made for each type of embedment, fill, or backfill material, and one additional gradation test shall be made for each additional 500 tons of each material. Moisture-density (Proctor) tests and relative density tests on the materials, and all in-place field density tests, shall be made at the expense of the Contractor.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION.

3.1.1. Clearing. All clearing shall be performed as necessary for access, stringing of pipeline materials, and construction of the pipeline and appurtenant structures.

3.2 EXCAVATION. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

Except where exterior surfaces are specified to be dampproofed, monolithic concrete manholes and other concrete structures or parts thereof, which do not have footings that extend beyond the outside face of exterior walls, may be placed directly against excavation faces without the use of outer forms, provided that such faces are stable and also provided that a layer of polyethylene film is placed between the earth

and the concrete.

3.2.1. Classification of Excavated Materials. No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

3.2.2. Unauthorized Excavation. Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced, by and at the expense of the Contractor, with concrete placed at the same time and monolithic with the concrete above.

3.3 BLASTING PROHIBITION. The Contractor shall not blast with explosives as an excavation method. This prohibition is to prevent damage to nearby residential structures.

3.4 DEWATERING. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations 12 inches or more below the bottom of the excavation.

Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

The Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

3.5 SHEETING AND SHORING. Except where banks are cut back on a stable slope, excavations for structures and trenches shall be in accordance with the Corps of Engineers safety and Health Requirements Manual EM 385-1-1.

Trench sheeting may be removed only if the pipe strength is sufficient to carry trench loads based on trench width to the back of sheeting. Trench sheeting shall not be pulled after backfilling. With the concurrence of the Contracting Officer, sheeting shall be left permanently in the trench.

Where trench sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed.

3.6 STABILIZATION. Subgrades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workers.

Subgrades for concrete structures or trench bottoms which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with crushed rock or gravel. The stabilizing

material shall be spread and compacted to a depth of not more than 4 inches; if the required depth exceeds 4 inches, the material shall be furnished and installed as specified for granular fills. The finished elevation of stabilized subgrades shall not be above subgrade elevations indicated on the drawings.

3.7 GRANULAR FILLS. Granular fills shall be provided where indicated on the drawings. Granular fills shall be placed on suitably prepared subgrades and compacted by vibration. Granular fills shall be compacted to not less than 70 percent relative density as determined by ASTM D4253 and D4254.

Where granular fills are to be covered with concrete, the top surface shall be graded to the required subgrade and covered with polyethylene film as specified in the concrete section.

3.8 TRENCH EXCAVATION. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. One block or 400 feet, whichever is the shorter, shall be the maximum length of open trench on any line under construction.

Except where tunneling is indicated on the drawings, is specified, or is permitted by the Contracting Officer, all trench excavation shall be open cut from the surface.

3.8.1. Alignment, Grade, and Minimum Cover. The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.

3.8.2. Limiting Trench Widths. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment. Minimum trench widths shall be as follows:

MINIMUM TRENCH WIDTHS

Nominal Pipe Size inches	Minimum Trench Width inches	Minimum Sidewall Clearance inches
Less than 27	Pipe OD plus 24	12

Specified minimum sidewall clearances are not minimum average clearances but are minimum clear distances which will be required to the trench excavation or the trench protective system.

Cutting trench banks on slopes to reduce earth load to prevent sliding and caving shall be used only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits

3.8.3. Mechanical Excavation. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

3.8.4. Cutting Concrete Surface Construction. Cuts in asphaltic concrete pavement and base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with a concrete saw in a manner which will provide a clean groove at least 1-1/2 inches deep along each side of the trench and along the perimeter of cuts for structures.

Asphaltic Concrete pavement and concrete base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the center line of the trench.

Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

Where the trench parallels the length of concrete walks, and the trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and subsequently replaced between existing joints or between saw cuts as specified for pavement.

3.8.5. Excavation Below Pipe Subgrade. Except where otherwise required, pipe trenches shall be excavated below the underside of the pipe, as indicated on Figure 1-02200, to provide for the installation of granular embedment.

3.8.6 Artificial Foundations in Trenches. Whenever unsuitable or unstable soil conditions are encountered, trenches shall be excavated below grade and the trench bottom shall be brought to grade with suitable material. In such cases, adjustments will be made in the Contract Price.

3.8.7. Bell Holes. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

3.9 PIPE EMBEDMENT. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the requirements indicated on Figure 1-02200 and to the following supplementary requirements.

Embedment material shall contain no cinders, clay lumps, or other material which may cause pipe corrosion.

3.9.1. Embedment Classes.

a. Class A Arch Encasement. Class A arch encasement shall be used where required by the drawings and where trench conditions require its use as determined by the Contracting Officer.

b. Class B Bedding. Class B bedding shall be used for all ductile iron, PVC, vitrified clay, prestressed concrete pipelines, and for all other pipelines not otherwise specified.

c. Class C Bedding. Class C bedding shall be used for all reinforced concrete pipelines.

3.9.2. Embedment for Ductile Iron, and PVC Pipelines. Granular embedment for ductile iron, and PVC pipelines shall be pea gravel or crushed rock with rounded or subrounded particles; crushed rock with sharp edges which could cause significant scratching or abrasion of the pipe shall not be used. Inundated sand may be used for granular embedment in locations where the use of water will cause no damage to

adjacent property and where it can be placed and properly compacted without damage to the pipe.

Inundated sand, if used for granular embedment, shall conform to the requirements for inundated sand backfill as specified herein.

3.9.3. Placement and Compaction. Granular embedment material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

Class C embedment shall be compacted to the top of the pipe in all areas where compacted backfill is specified.

Each lift of granular embedment material shall be vibrated with a mechanical probe type vibrator during placement to ensure that all spaces beneath the pipe are filled. Each lift of embedment material shall be compacted with a platform type vibrating compactor to at least 70 percent relative density as determined by ASTM D4253 and D4254.

3.10 TRENCH BACKFILL. All trench backfill above pipe embedment shall conform to the following requirements.

A layer of backfill material not more than 8 inches deep may be placed over concrete arch encasement or concrete reaction blocking after the concrete has reached its initial set, to aid curing. No additional backfill shall be placed over arch encasement or blocking until the concrete has been in place for at least 3 days.

3.10.1. Compacted Backfill. Compacted backfill will be required for the full depth of the trench above the embedment in the following locations:

Where beneath pavements, surfacings, driveways, curbs, gutters, walks, or other surface construction or structures.

Where in street, road, or highway shoulders.

Beneath the detention reservoir dam within limits shown on drawings.

In established lawn areas.

The top portion of backfill beneath established lawn areas shall be finished with at least 12 inches of topsoil corresponding to, or better than, that underlying adjoining lawn areas.

At the option of the Contractor, compacted backfill may be (a) suitable job excavated material, (b) inundated sand, or (c) graded gravel, as described below:

a. Job Excavated Material. Job excavated material may be used for compacted backfill when the job excavated material is finely divided

and free from debris, organic material, cinders, any corrosive material, and stones larger than 3 inches in greatest dimension. Masses of moist, stiff clay shall not be used. Job excavated materials shall be placed in uniform layers not exceeding 8 inches in uncompacted thickness. Each layer of material shall have the best possible moisture content for satisfactory compaction. The material in each layer shall be wetted or dried as required and thoroughly mixed to ensure uniform moisture content and adequate compaction. Increased layer thickness may be permitted for noncohesive material if the Contractor demonstrates to the satisfaction of the Contracting Officer that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe. Job excavated material shall be compacted to 95 percent of maximum density at optimum moisture content, as determined by ASTM D698 when that test is appropriate, or to 70 percent relative density, as determined by ASTM D4253 and D4254 when those tests are appropriate.

b. Inundated Sand. Sand shall be deposited in, or placed simultaneously with the application of, water so that the sand is inundated during compaction. During placement, the sand shall be compacted with a mechanical probe type vibrator. Inundated sand shall be compacted to 70 percent relative density as determined by ASTM D4253 and D4254.

c. Graded Gravel. Gravel backfill shall be deposited in uniform layers not exceeding 12 inches in uncompacted thickness. The backfill shall be compacted with a suitable vibratory roller or platform vibrator to at least 70 percent relative density as determined by ASTM D4253 and D4254.

3.10.2. Uncompacted Backfill. Compaction of trench backfill above pipe embedment in locations other than those specified will not be required except to the extent necessary to prevent future settlement. The Contractor shall be responsible for backfill settlement as specified.

Uncompacted earth backfill material to be placed above embedments shall be free of brush, roots more than 2 inches in diameter, debris, cinders, and any corrosive material, but may contain rubble and detritus from rock excavation, stones, and boulders in certain portions of the trench depth.

Uncompacted backfill material above embedments shall be placed by methods which will not impose excessive concentrated or unbalanced loads, shock, or impact on installed pipe, and which will not result in displacement of the pipe.

Compact masses of stiff clay or other consolidated material more than 1 cubic foot in volume shall not be permitted to fall more than 5 feet into the trench, unless cushioned by at least 2 feet of loose backfill above pipe embedment.

No uncompacted trench backfill material containing rocks or rock excavation detritus shall be placed in the upper 18 inches of the trench, nor shall any stone larger than 8 inches in its greatest dimension be placed within 3 feet of the top of pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and so arranged that no interference with backfill settlement will result.

3.10.3. Water-Settled Earth Backfill. Where water settlement of uncompacted earth backfill is permitted, water shall be applied so that effective settlement is obtained with a minimum of water. Trenches shall not be permitted to overflow. Settlement by water puddling shall

not be done until after the trench has been backfilled to the ground surface. Water shall be introduced above the pipe embedment through a long pipe nozzle so that disturbance of any granular embedment or compacted material will be held to an absolute minimum. Backfill material shall be added as necessary to compensate for settlement below surface grade, and settled during puddling operations.

3.11 STRUCTURE BACKFILL. Backfill around structures shall be compacted to the extent necessary to prevent future settlement. Water settlement will be permitted only where it would cause no damage to the work.

Material for backfill shall be composed of earth only and shall contain no wood, grass, roots, broken concrete, stones, trash, or debris of any kind. No tamped or otherwise mechanically compacted backfill shall be deposited or compacted in water.

3.12 PIPE CASING. Pipelines shall be constructed in a bored and jacked casing of the type designated on the drawings, in conformity with the requirements which follow. Before starting work on the bored and jacked casing, detailed drawings, specifications, and other data covering the liner and pipe spacers to be used shall be submitted in accordance with the submittals section.

3.12.1. Smooth Steel Casing Pipe. The steel casing pipe crossing Route W, shall be installed by jacking into place. All other casing pipe shall be installed in open cut trench. Earth displaced by the bored and jacked conduit shall be removed through the interior of the conduit by hand, by auger, or by other acceptable means. Sections of the casing pipe shall be welded together to form a continuous conduit capable of resisting all stresses, including jacking stresses. The casing pipe conduit in its final position shall be straight and true in alignment and grade, as required by the drawings. There shall be no space between the earth and the outside of the casing.

3.12.2. Casing Spacers. Casing spacers shall be provided as indicated on the drawings.

3.12.3. End Closure. Both ends of each casing conduit shall be closed with a molded rubber end seal.

3.12.4. Interruption of Traffic. No interruption of traffic will be permitted at any location where bored crossings are required.

3.13 DRAINAGE MAINTENANCE. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or watercourses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway, to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other watercourses crossed by the line of trench shall be removed immediately after backfilling is completed, and the original section, grades, and contours of ditches or watercourses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3.14 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES. Where trenches are constructed in ditches or other watercourses, backfill shall be protected from surface erosion. Where the grade of the ditch exceeds 1 percent, ditch checks shall be installed. Unless otherwise indicated on the drawings, ditch checks shall be concrete. Ditch checks shall extend at least 2 feet below the original ditch or watercourse bottom

for the full bottom width and at least 18 inches into the side slopes, and shall be at least 12 inches thick.

3.15 FINAL GRADING AND PLACEMENT OF TOPSOIL. After other outside work has been finished, and backfilling and embankments completed and settled, all areas which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours. All cuts, fills, embankments, and other areas which have been disturbed or damaged by construction operations shall be surfaced with topsoil to a depth of at least 4 inches. Topsoil shall be of a quality at least equal to the existing topsoil in adjacent areas, free from trash, stones, and debris, and well suited to support plant growth.

Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to manual methods. All surfaces shall be graded to secure effective drainage. Unless otherwise indicated, a slope of at least 1 percent shall be provided.

Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris.

3.16 DISPOSAL OF EXCESS EXCAVATED MATERIALS. Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site of the work.

Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill, debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site of the work.

Excess earth from excavations located in unimproved property may be distributed directly over the pipe trench and within the pipeline right-of-way to a maximum depth of 6 inches above the original ground surface elevation at and across the trench and sloping uniformly each way. Material thus wasted shall be carefully finished with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point. Wasting of excess excavated material in the above manner will not be permitted where the line of trench crosses or is within a railroad, public road, or highway right-of-way. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing shall be a subsidiary obligation of the Contractor and no separate payment will be made therefor.

3.17 SETTLEMENT. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period.

The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Contracting Officer.

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SECTION 02220
EMBANKMENT

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SECTION 02220 – EMBANKMENT

PART 1 GENERAL

1.1. SCOPE. The work covered by this section consists of furnishing all plant, labor, and equipment and performing all operations in connection with preparing the embankment foundations, including the cofferdam embankment, and placing and compacting all permanent earth fill and backfill in accordance with the contract drawings and these specifications.

1.1.1 Definitions. The term "embankment" as used in these specifications is defined as the earth fill portions of the dam structures and cofferdam embankment including all types of earth fill for the dam, cofferdam, outlet works, toe drain, inspection/cutoff trench, and backfill for spillway walls, excepting stone used for slope protection. "Compacted fill" includes all fill deposited in layers and compacted by rolling or tamping. The types of compacted earth fill are:

(1) "Impervious fill" for the embankment dam, cut-off trench, cofferdam, spillway walls within the embankment dam profile, and on top of the sand backfill behind the spillway walls as shown on the drawings.

(2) "sand fill" forming the pervious toe drain

(3) "sand backfill" for portions of the embankment surrounding the outlet works and behind the spillway walls as specified herein and as shown on the drawings.

(4) "Uncompacted fill" includes all fill, placed in stockpiles for future use, and in excavated borrow areas and channel plugs, deposited in layers, but not compacted except by the controlled movement of hauling and spreading equipment.

(5) "Disposal" includes all excavated earth material unsuitable for use as embankment and cofferdam fill, material from the required excavation, and stripping in excess of the amount required to construct the cofferdams, haul roads, and facilities, and all other excavated material placed in the borrow area or as directed by the Contracting Officer .

1.2. QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of its quality control for all construction operations, including but not limited to the following:

(1) Lines, grades, section, zoning of toe drain and final dressing.

(2) Foundation preparation (including dewatering where required).

(3) Placement, spreading (including lift thickness requirements), disking and compaction of embankment materials.

(4) Moisture content, gradation, and density of compacted fills after compaction, as herein specified.

(5) Equipment.

1.2.2 Quality Control Sampling and Testing. During construction, the Contractor shall sample and test the embankment materials and the compacted fills for conformance with all specification requirements. All sampling and testing, including the equipment, labor, and laboratory facilities necessary to perform the tests as herein required, shall be at the expense of the Contractor. A record of sampling and testing shall be provided as specified in. The Contractor shall use standard Government forms for recording and reporting test results. These forms will be furnished to the Contractor by the Contracting Officer. The original copy of all sampling and test records, calculations, and plots shall be furnished to the Contracting Officer immediately following completion of the tests.

1.2.2.1 Sampling and Testing Procedures. Samples of embankment materials for quality control tests shall be taken from sources of materials, processing plants or stockpiles, transporting or hauling equipment, and from material placed in the embankment before and after compaction. Samples shall be taken at scheduled periodic intervals during construction, shall be representative of embankment materials being placed, and shall be of such size, weight or volume as to be representative of the material sampled. Quality control tests for embankment materials shall be performed in accordance with ASTM C 136. Classification of soils shall be in accordance with ASTM D 2487. Density determination of soil shall be in accordance with ASTM D 1556, ASTM D 4253 and ASTM D 4254.

1.2.2.2 Frequency of Sampling and Testing. The frequency of quality control sampling and testing for the embankment shall not be less than one test per quantity of volume of impervious, sand, and sand backfill material designated, and the type of test shall be as designated in the following tabulation.

MATERIAL - TESTS	MINIMUM TEST INTERVAL
Compacted Fill, Impervious	
Moisture Determination	1000 cu. yds. minimum or 1 test per 8 hour shift if less than 1000 cu. yd. placed per shift
Field Density	1000 cu. yds. minimum or 1 test per 8 hour shift if less than 1000 cu. yd. placed per shift
Sand Fill and Sand Backfill	
Field Density	1000 cu. yds. or 1 test per 8 hour shift if less than 1000 cu. yd. placed per shift
Sieve Analysis	1000 cu. yds. or 1 test per 8 hour shift if less than 1000 cu. yd. placed per shift

1.2.3 Reporting. A copy of the results of these tests as well as the records of any corrective action taken shall be furnished to the Government on the following basis:

MATERIAL - TESTS	REPORTING PERIOD
Compacted Fill, Impervious	
Moisture Determination	Within 24 hours after sample is obtained.
Atterberg Limits	Within 48 hours after sample is obtained.
Field Density	Within 24 hours after sample is obtained
Sand Fill and Sand Backfill	
Field Density	Within 24 hours after sample is obtained.
Sieve Analysis	Within 24 hours after sample is obtained.

1.3. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

1.3.1 American Society for Testing and Materials (ASTM) .

C 136-96	Sieve Analysis of Fine and Coarse Aggregates
D 1556-90	Density of Soil in Place by the Sand-Cone Method
D 1557-91	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft- lbf/cu ft (2,700 kN-m/cu m))
D 2487-98	Classification of Soils for Engineering Purposes
D 4253-93	Maximum Index Density of Soils Using a Vibratory Table
D 4254-89	Minimum Index Density of Soils and Calculation of Relative Density

1.4. QUALITY ASSURANCE.

1.4.1 Density Tests by Government . During the construction of the embankment, the Government may elect to conduct independent density tests which may cause delays in the Contractor's placing and compaction operations. The Contractor shall coordinate its work with the operations of the Government's density tests.

PART 2 PRODUCTS

PART 2.1 MATERIALS

2.1.1 General. The origin of any fill material will not necessarily determine where it may be used in the embankment. Materials for embankment fill shall be secured from required excavations and from the borrow areas indicated on the drawings. No off site borrow material will be permitted. The most suitable materials obtainable from these sources shall be used.

Material to be disposed of will be specifically designated by the Contracting Officer at the time the material is excavated. Materials containing brush, roots, sod or other perishable materials will be considered unsuitable. The suitability of the materials shall be subject to the approval of the Contracting Officer and their disposition in the embankment shall be as directed by the Contracting Officer. The Contractor shall excavate in the borrow areas in the location determined by the Contracting Officer, whenever such control is necessary to obtain the type of material required for the embankment. Mixing of materials during the excavating process at the borrow area may be required. All soils shall be classified in accordance with ASTM D 2487.

2.1.2 Sand Fill. Material for compacted sand fill shall be as defined in paragraphs 2.1.9 through 2.1.11, and as defined in Section 0227 1 - MECHANICALLY STABILIZED EARTH WALLS. It shall be free from unsuitable and frozen materials as defined in Paragraphs 2.1.4 and 2.1.5.

2.1.3 Reserved.

2.1.4 Cofferdam Fill.

2.1.4.1 Material for cofferdams or ditch plugs outside the limits of the completed embankment may consist of soils obtained from the required foundation excavation, the excavation of the diversion channel, cofferdam, and material resulting from stripping of the foundation and borrow areas excluding the upper layer of organic material. Soft weathered rock, which breaks up under the rolling to form essentially a soil which will compact without excessive voids may be used for cofferdam fill, if approved by the Contracting Officer.

2.1.5 Unsuitable Materials. Materials, which are classified as unsuitable for embankment material, are defined as masses of organic matter, sticks, branches, roots, and other debris. As earth from the designated borrow areas may contain excessive amounts of wood, isolated pieces of wood will not be considered objectionable in the embankment provided their length does not exceed one foot, their cross sectional area is less than 4 square inches, and they are distributed throughout the fill. Not more than 1 percent (by volume) of objectionable material shall be contained in the earth material placed in each cubic yard of the embankment. Pockets and/or zones of wood shall not be placed in the embankment.

2.1.6 Frozen Material. Under no circumstances shall frozen material be placed in an embankment.

2.1.7 Uncompacted Fill.

2.1.7.1 Material for Future Use. Material placed in stockpiles for future use within the compacted embankment shall consist of those materials so designated in Paragraph 2.1.2.

2.1.8 Disposal Material. Except as otherwise required by the Contracting Officer, all types of excavated earth materials unsuitable for use in permanent fills and cofferdams and that material suitable for, but in excess of, that required for the cofferdam, haul roads, and Contractor's facilities, shall be disposed in the excavated borrow areas or as directed by the Contracting Officer.

2.1.9 Sand Fill and Sand Backfill Around the Outlet Pipe. Material for the sand backfill may be obtained from approved off site commercial material sources. Sand fill and sand backfill materials shall be composed of tough, durable particles; shall be reasonably free from thin, flat and elongated pieces; and shall contain no organic matter nor soft, friable particles in quantities considered objectionable by the Contracting Officer. Materials shall consist of natural sand well graded between the limits specified below:

Sieve Size	Percent by Weight Passing
3/8 inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	5 - 30
No. 100	0 - 10

Gradation of the material shall be determined in accordance with ASTM C 136. All points on individual grading curves obtained from representative samples of sand fill and sand backfill shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical analysis diagram. The individual grading curves within these limits shall not exhibit abrupt changes in slope denoting skip grading, scalping of certain sizes or other irregularities which would be detrimental to the proper functioning of the sand fill and sand backfill.

2.1.10 Sand Backfill Behind Spillway Walls. Material for the sand backfill shall consist of sand from offsite sources. Gradation shall be as specified in Paragraph 2.1.8.

2.1.11 Filter Material. Filter material shall be composed of sand and gravel. The material shall not contain vegetative matter nor soft, friable, thin, or excessive amounts of elongated particles. The filter material is not available within the right-of-way limits, and the material shall be subject to the approval of the Contracting Officer as to quality and shall conform to the following gradation:

Sieve Size U.S. Standard Square Mesh	Percent by Weight Passing Square Mesh Sieves
1 inch	100
1/2 inch	60 - 90
No. 4	40 - 60
No. 16	25 - 45
No. 100	0 - 5

2.2 COMPACTION EQUIPMENT.

2.2.1 Equipment. Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

(1) Tamping Rollers. Tamping rollers shall consist of two or more roller drums mounted side by side in a suitable frame. Rollers operated in tandem sets shall be towed in a manner such that the prints of the tamping feet produced by the tandem units do not overlap. Each drum of a roller shall have an outside diameter of not less than 5 feet and shall be not less than 5 feet nor more than 6 feet in length. The space between two adjacent drums, when on a level surface, shall be not less than 12 inches nor more than 15 inches. Each drum shall be free to pivot about an axis parallel to the direction of travel. Each drum ballasted with fluid shall be equipped with at

least one pressure-relief valve and with at least one safety head. The pressure-relief valve shall be a manually operated valve and shall be opened periodically. Personnel responsible for opening pressure-relief valves shall be instructed to ascertain that valve openings are free from plugging to assure that any pressure developed in roller drums is released at each inspection. At least one tamping foot shall be provided for each 100 square inches of drum surface. The space measured on the surface of the drum, between the centers of any two adjacent tamping feet shall be not less than 9 inches. The length of each tamping foot from the outside surface of the drum shall be not more than 11 inches and shall be maintained at not less than 9 inches. The cross-section area of each tamping foot shall be not more than 10 square inches at a plane normal to the axis of the shank 6 inches from the drum surface, and shall be maintained at not less than 7 square inches nor more than 10 square inches at a plane normal to the axis of the shank 8 inches from the drum surface. During the operation of rolling, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping rollers. The weight of a roller when fully loaded shall be not less than 4,000 pounds per foot of length of drum. The weight of a roller empty shall be not more than 2,500 pounds per foot of length of drum. The loading used in the roller drums and operation of the rollers shall be as required to obtain the desired compaction. If more than one roller is used on any one layer of fill, all rollers so used shall be of the same type and essentially of the same dimensions. Rollers shall be drawn by crawler-type or rubber-tired tractors at a speed not to exceed 5.0 miles per hour. The use of rubber-tired tractors shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller. Tractors used for pulling rollers shall have sufficient power to pull the roller satisfactorily when drums are fully loaded with sand and water. At the option of the Contractor, self-propelled tamping rollers conforming to the above requirements may be used in lieu of tractor-drawn tamping rollers. Self-propelled rollers exceeding the empty weight requirements may be used, provided that when the Contracting Officer determines self-propelled roller performance is unsatisfactory, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the nominal foot pressure of the specified towed rollers for the particular working condition required by the substitution of tamping feet having a face area not exceeding 14 square inches. If the self-propelled rollers cause shearing of the fill or laminations in the fill, the Contracting Officer may direct that the rollers be removed from the fill and that tractor-drawn tamping rollers conforming with these specifications be used. For self-propelled rollers, in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 pounds per square inch. Self-propelled rollers shall be operated at a speed not to exceed 5.0 miles per hour. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the roller, and variations in the weight as may be found necessary to secure optimum compaction of the earth-fill materials.

(2) Rubber-tired Rollers. Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as can be maintained at tire pressures between 80 and 100 pounds per square inch for a 25,000-pound wheel load during rolling operations. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels shall be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the tire width of a single tire at the operating pressure for a 25,000 pound wheel load. The roller shall be provided with a body suitable for ballast loading

such that the load per wheel may be varied, as directed by the Contracting Officer, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed five miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer. If the rubber-tired rollers cause shearing of the fill or laminations in the fill, the Contracting Officer may direct that the rollers be removed from the fill and that tractor-drawn tamping rollers conforming with the provisions of Paragraph 2.2.1 (1) be used.

(3) Vibratory Rollers. Vibratory rollers for compacting sand fill and sand backfill shall be towed, and shall have a total static weight of not less than 20,000 pounds, with at least 90 percent of the weight transmitted to the ground through a single smooth drum when the roller is standing in a level position hitched to the towing vehicle. The diameter of the drums shall be between 5 and 5.5 feet and the width between 6 and 6.5 feet. The unsprung weight of drum, shaft, and internal mechanism shall not be less than 12,000 pounds. The frequency of vibration during operation shall be between 1,100 and 1,500 fpm, and the dynamic force shall be not less than 40,000 pounds at 1,400 fpm. The roller shall be towed at speeds not to exceed 1.5 miles per hour by a crawler tractor with a minimum drawbar rating of 50 horsepower. The equipment manufacturer shall furnish sufficient data, drawings, and computations for verification of the above specifications, and the character and efficiency of this equipment shall be subject to the approval of the Contracting Officer. Vibratory rollers used for compacting sand fill, and sand backfill, shall conform with these requirements, with the exception that they may be either towed or self-propelled.

(4) Power Tampers. Compaction of material, in areas where it is impracticable to use a roller or tractor, shall be performed by the use of approved power tampers.

2.3. UNDISTURBED BLOCK SAMPLES.

2.3.1 General. After embankment materials have been placed on the fill area and compacted as specified in Paragraphs 3.3 and 3.4, respectively, undisturbed block samples (11" x 11" x 11") of the material shall be obtained by the Contractor at the elevation and locations as directed by the Contracting Officer. The samples shall be taken, sealed, and boxed in the presence, and under the direction of a Government-employed Geotechnical engineer or technician. In addition to the record sample, a 50-pound bag sample of the adjacent embankment material shall also be obtained. All samples shall be delivered to the Contracting Officer at the project site.

2.3.2 Material, Labor and Equipment.

2.3.2.1 General. The Contractor shall furnish all materials, labor and equipment required to excavate, seal, box, and mark the samples as directed. Materials and equipment shall include: shovels, picks, trowels, 4-inch paint brush, butcher knives, thin piano-wire cutter, aluminum foil, and other cutting blades, and microcrystalline sealing wax.

2.3.2.2 Sample Containers. Sample containers shall consist of approved boxes of size to fit, with space for waxing the sample. The containers shall be of regular slotted corrugated cardboard with a minimum bursting strength of 200 p.s.i., "C" flute, and shall be approximately 12-inches x 12-inches x 12-inches (inside measurements) with a 2-inch tape joint or other equivalent container as approved by the Contracting Officer. The containers shall be lined with aluminum foil. Sample containers shall be stenciled on top and one

side with the following information:

Cape Girardeau-Jackson Detention Reservoir
Contract No.
Sample No.
Station and Offset
Elevation __ to __
Date

Sample containers shall also be stenciled near the top edge of all four sides with an arrow and the word "UP". The Sample No., Station, Offset, Elevation and Date shall be filled in at time sample is taken.

2.3.2.3 Shipping Containers. Shipping containers shall be provided for all record samples obtained. The shipping containers shall be regular slotted corrugated cardboard, or equivalent material approved by the Contracting Officer, with a minimum bursting strength of 200 p.s.i., "C" flute, and shall be approximately 16-inches x 16-inches x 16-inches inside measurements, with 2-inch tape joint. Two flat steel bands shall extend around the packed shipping container with the steel banding straps crossing at right angles on both the top and bottom surfaces. The banding straps shall be located at the mid-point of each side, and the fastening clip located on the sides of the container. The steel banding straps shall be approximately 3/4 -inch wide and .02-inch thick and shall have two fastening clips for each band. The sample container shall be completely enclosed, within the shipping container, by a minimum of 2 inches of polyethylene or other similar cushioning material as approved by the Contracting Officer, so as to restrict movement and prevent damage to the sample. Each shipping container shall have stenciled on each side near the top an arrow and the words:

THIS END UP
HANDLE WITH CARE

2.3.3 Procedure. When the elevation of the fill is approximately one foot greater than the elevation of the record sample to be taken, the Contractor shall smooth the ground surface, mark the outline of the sample to be secured and excavate around the sample using hand tools, staying a minimum distance of six inches from the sample. Final trimming to size shall be accomplished using a large butcher knife or sharpened trowel. All digging, trimming, etc., shall be performed in such manner that no pressure is exerted on the sample. After trimming to size and shape, the sample container shall be placed around the samples and extended approximately 1/2 inch above the top of the sample. After centering sample therein and sealing around the bottom of the box with loose soil, the space between the sample and container shall be filled with warm melted wax (temperature at placement shall not exceed 170 degrees F). After wax has cooled, wax over the top of the sample filling the container completely. After cooling, top of the container shall be closed and taped across the top in two directions. The sample shall be cut from the parent material; the sample and container shall be turned onto the container's top and the bottom of the sample carefully trimmed. Approximately 1/2 -inch of the sample shall be dug out of the container, leaving a depression. This space shall be filled with wax. The bottom of the box shall be closed and taped as previously accomplished for the top after the wax has cooled; the boxed sample shall then be turned right side up, marked as directed and placed in shipping container. All operations around and with the sample must be carefully accomplished so that the sample is "undisturbed".

PART 3 EXECUTION

3.1 GENERAL.

3.1.1 Conduct of the Work. The Contractor shall maintain and protect the embankment in a satisfactory condition at all times until final completion and acceptance of all work under the contract. If in the opinion of the Contracting Officer the hauling equipment causes horizontal shears or slickensides, rutting, quaking, heaving, cracking or excessive deformation of the embankment, the Contractor shall limit the type, load or travel speed of the hauling equipment on the embankment. Any approved embankment material which is lost in transit or rendered unsuitable after being placed in the embankment and before final acceptance of the work, shall be replaced by the Contractor in a satisfactory manner and at no additional cost to the Government. The Contractor shall excavate and remove from the embankment any material that is classified unsuitable as defined in Paragraph 1.1.1 and shall also dispose of such material and refill the excavated area as directed, all at no additional cost to the Government. The Contractor may be required to remove, at its own expense, any embankment material placed outside of prescribed slope lines.

3.1.2 Haul Roads. Haul roads shall conform to the requirements of Section 01500-3.1 and shall be designed to maintain the intended traffic, to be free draining and shall be maintained in good condition throughout the contract period, unless otherwise directed by the Contracting Officer. Haul roads within the area of contact between the embankment and its foundation and abutments shall be removed and the area shall be treated as specified in Paragraph 3.2.1.

3.1.3 Stockpiling from Borrow Area. When the excavation from the borrow area, including that from required excavation, progresses at a faster rate than placement in the fill is being accomplished, such excavated material shall be stockpiled at approved locations adjacent to the work until its use is authorized. No payment will be made for such stockpiling nor for the reloading and hauling of this material to its final position in the embankment. The Contractor shall stockpile the material in such a manner as to provide surface drainage and so as not to interfere with the natural drainage of the area.

3.1.4 Stockpiling of Disposal Material. When the excavation of unsuitable material progresses at a faster rate than disposal areas in the excavated borrow area become available, such excavated material shall be stockpiled at approved locations until such time as those areas become available. No payment will be made for such stockpiling nor the reloading and hauling of this material to its final position in the excavated borrow areas. Said stockpiles shall be located so as not to interfere with the natural drainage of the area. All disposal area fill, temporary or permanent, shall be placed in such a manner that the surfaces of the fill are smooth and sloped to drain. If directed, the Contractor shall construct ditches to maintain the disposal areas in a free draining condition. Stockpile limitations for all disposal material are as follows:

(1) The toe of the stockpile shall be at least 50 feet from the top of the existing river bank and/or any excavation slope.

(2) Maximum stockpile height shall be 20 feet.

(3) The steepest stockpile slope shall be 1V on 2H.

3.1.5 Water Crossings. If the Contractor proposes to construct a water crossing, it shall be so designed that the back water produced by the crossing

will not endanger the cofferdams. The design of the crossings shall be submitted to the Contracting Officer for review.

3.2 PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS.

3.2.1 Earth. After excavation or stripping of the embankment foundation and excavation of the cut-off trench to the extent indicated on the drawings or otherwise required, the sides of stump holes, test pits, and other cavities, depressions, or joints shall be broken down, where so directed, so as to flatten out the slopes, and the sides of the cut or hole shall be scarified to provide bond between the foundation material and the fill. The slopes of the cut-off trench shall be scarified, as directed by the Contracting Officer. Unless otherwise directed, each depression shall be filled with impervious material. The fill shall be placed in layers to the moisture content, and compacted in accordance with the applicable provisions of Paragraph 3.4. Materials, which cannot be compacted by roller equipment because of inadequate clearances, shall be spread in 4-inch layers and compacted with power tampers to an extent equal to that of the contiguous embankment fill material. Power tampers shall be used within 2 feet of all wallsnd the outlet works. After filling of depressions and cut-off trench and immediately prior to placement of compacted fill in any section of the embankment, the foundation of such section shall be loosened thoroughly by scarifying, plowing, disking or harrowing to a minimum depth of six inches, and the moisture content shall be adjusted to the amount specified in Paragraph 3.4 for the appropriate type of material, except in areas where this requirement is waived by the Contracting Officer. After removal of roots or other debris turned up in the process of loosening, the entire surface of the embankment foundation area shall be compacted as hereinafter specified for the appropriate type of fill. Prior to placement of compacted fill on or against the surfaces of any partial fill section, all soft or loose material, and all material containing cracks or gullies, shall be removed. The remaining surface of the partial fill shall be loosened by scarifying, plowing, disking or harrowing to a minimum depth of six inches, and the moisture content shall be adjusted as specified in Paragraph 3.4 for the appropriate type of material. The surface of the partial fill section upon which fill is to be placed shall then be compacted as hereinafter specified for the appropriate type of fill. If at any time during this contract, the Contractor finds it necessary to terminate placement of compacted fill for a period of 48 hours or more, and the Contractor has elected to provide initial compaction by the use of a tamping roller, the Contractor will be required to seal the surface of the fill using a rubber-tired roller as specified in Paragraph 2.2.1 (2). A minimum of two passes of the rubber-tired roller will be required to seal the surface; however, additional passes may be directed by the Contracting Officer to ensure that the surface is properly sealed. Prior to the placement of additional fill, the surface shall be prepared according to the appropriate provisions of this paragraph. At the end of each day of work, the fill shall be bladed to remove all ruts and windrows so as to ensure a surface that will permit proper drainage of all surface water.

3.2.2 Rock. All rock surfaces upon which or against which embankment materials are to be placed shall be prepared in accordance with the applicable provisions of SECTION 02225 prior to the placement of embankment material.

3.3. PLACEMENT.

3.3.1 General. No fill shall be placed on any part of the embankment foundation until such areas have been inspected and approved. Backfill shall not be placed against concrete that has not reached its design strength. The gradation and distribution of materials throughout the compacted earth fill

section of the dam shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. Successive loads of material shall be dumped at locations on the fill as directed or approved by the Contracting Officer. No fill shall be placed upon a frozen surface, nor shall snow, ice, or frozen earth be incorporated in the embankment. During all phases of embankment placement, the Contractor shall control surface water. The fill shall be sloped in such a manner as to ensure drainage and eliminate the possibility of ponding water on the fill. In no case shall the fill be sloped in such a manner as to result in water draining toward completed portions of sand backfill around the outlet works or the pervious toe drain. Should water become ponded on the surface of any portion of the fill, the Contractor shall effect its removal within four hours after the Contracting Officer determines such remedial measures can be successfully undertaken. All compacted material within such a ponding area found to have an in-place moisture or density not corresponding to that required by these specifications shall be reworked and/or replaced to the extent necessary to ensure a suitable fill, all as determined by the Contracting Officer. The removal of ponded water and the reworking and/or replacement of any fill found to be unacceptable with respect to in-place moisture and/or density shall be accomplished at no additional cost to the Government.

3.3.2 Rate of Placement. Unless otherwise directed, the embankment shall be maintained at approximately the same level regardless of the number of types of materials being placed. The Contractor shall be responsible for protecting the sand fill from contamination by muddy water, foreign materials, and/or washouts. If sand fill is found to contain foreign material or muddy water or has been disturbed by washouts, it shall be removed and replaced by the Contractor at no additional cost to the Government. The Contracting Officer will determine the extent to which the sand fill will require replacement.

3.3.3 Impervious Fill. Impervious fill shall be placed in the embankment section, cut-off trenches, behind the spillway walls within the embankment dam profile, and around the outlet pipe as specified in Paragraphs 3.4.1 and 3.3.6 respectively, and on top of the sand backfill behind the spillway walls.

3.3.4 Cofferdam Fill. All portions of the cofferdam system shall be semi-compacted impervious fill, placed to the lines and grades shown on the drawings.

3.3.5 Impervious Cap on Spillway Wall Backfill. Impervious fill on the sand backfill behind the spillway walls shall be semi-compacted to the lines and grades shown on the drawings. Compaction shall be the same as those specified for cofferdam fill in Paragraph 3.4.7.

3.3.6 Outlet Pipe Backfill. Sand backfill and impervious fill shall be placed around the outlet pipe as shown on the drawings. The bottom half of the pipe shall be grouted into rock or placed on a concrete pad as shown on the drawings. Sand backfill shall be placed around the top half of the downstream one-third of the pipe. Impervious fill shall be placed around the top half of the upstream two-thirds of the pipe.

3.3.7 Stockpiles and Disposal Areas. Fill placed in the excavated borrow areas and in stockpile areas shall be uncompacted fill.

3.3.8 Toe Drains. Sand fill for the pervious toe drains shall be placed to the lines and grades shown on the drawings.

3.3.9 Spillway Structure Walls. Sand backfill shall be placed behind the spillway structure walls to the lines and grades shown on the drawings.

3.3.10 Spreading. After dumping, the materials shall be spread by bulldozers or other approved means in approximately horizontal layers over the entire fill areas. Unless otherwise directed, the thickness of these layers before compaction with tamping type or rubber-tired rollers shall not be more than 8 inches for impervious materials, nor more than 12 inches for cofferdam fills. Sand fill and sand backfill shall be spread in layers not more than 8 inches in thickness. Suitable means shall be provided to determine the loose lift thickness during the placement of all material types. The number and location of measuring devices or the method of measuring shall be approved by the Contracting Officer. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layers, it shall be loosened by harrowing, or by any other approved method, before the succeeding layer is placed thereon. During the dumping and spreading processes, the Contractor shall maintain at all times a workforce adequate to remove all roots and debris from all embankment materials and all stones of greater than 5 inches in maximum dimension from impervious materials. Stone so removed shall be placed in the designated disposal areas and the roots and debris shall be removed from the embankment and disposed of in an approved manner. The entire surface of any section of the embankment under construction shall be maintained in such condition that construction equipment can travel on any part of any one section. Ruts in the surface of any layer shall be filled satisfactorily before compacting.

3.4. MOISTURE CONTROL AND COMPACTION. The materials in each layer of the embankment fill shall be placed at the moisture content specified in Paragraph 3.4.1, which corresponds to 95 percent of the optimum dry density as determined by the Contracting Officer. Material that is not within the specified limits after compaction shall be removed and replaced to the specified moisture content and density, at no additional cost to the Government.

3.4.1 Embankment Dam and Inspection/Cutoff Trench Fill. The moisture content after compaction shall be as uniform as practicable throughout any one layer of impervious materials. The moisture content after compaction within the embankment dam and cutoff trench shall be within the limits of 3 percentage points above optimum and 2 percentage points below optimum, except between Stations 2+25 and 7+50. Moisture content after compaction shall be within the limits of optimum and 3 percentage points above optimum as determined by the Contracting Officer for both the embankment dam and cutoff trench. Material that is too wet shall be spread on the embankment and permitted to dry, assisted by disking or harrowing until the moisture content is reduced to an amount within the specified limits. When the material is too dry, the Contractor will be required to sprinkle each layer on the fill. Harrowing or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of the embankment so that the material is too wet to obtain the desired compaction, the rolling on that section of the embankment shall be delayed until the moisture content of the material is reduced to an amount within the specified limits. If it is impracticable to obtain the specified moisture content by wetting or drying the material on the fill, the Contractor may be required to prewet or dry back the material at the source of excavation.

3.4.1.1 If, in the opinion of the Contracting Officer, the top or contact surfaces of a partial fill section become too dry to permit suitable bond between these surfaces and the additional fill to be placed thereon, the Contractor shall loosen the dried materials by scarifying or disking to such depths as may be directed by the Contracting Officer, shall dampen the loosened material to an acceptable moisture content, and shall compact this layer in accordance with the applicable requirements of Paragraph 3.4.5 to densities comparable to the underlying embankment.

3.4.1.2 If, in the opinion of the Contracting Officer, the top or contact surfaces of a partial fill section become too wet to permit suitable bond between these surfaces and the additional fill to be placed thereon, the wet material shall be scarified and permitted to dry, assisted by disking or harrowing, if necessary, to such depths as may be directed by the Contracting Officer. The material shall be dried to an acceptable moisture content and compacted in accordance with the applicable requirements of Paragraph 3.4.5 to densities comparable to the underlying embankment.

3.4.2 Cofferdam Fill.

3.4.2.1 General. The cofferdam fill material shall be placed at its natural moisture content. No moisture control will be required by the Contractor, unless, in the opinion of the Contracting Officer, no effective compaction is being obtained with the prescribed compactive effort due to the material being too wet or too dry. In such case, the Contractor may be directed to perform moisture control as prescribed below. If the material is too wet, it may be stockpiled and allowed to drain before it is placed in the embankment cross section and/or the wet material may be processed by disking and harrowing, if necessary, until the moisture content is reduced sufficiently. If the material is too dry, it may be prewet in the borrow area, or sufficient moisture uniformly distributed in each layer before rolling. If the Contractor is directed to do any work in moisture control outlined in this subparagraph, an equitable adjustment in the contract price and time will be made in accordance with the Contract Clause entitled "Changes".

3.4.2.2 Disposal and Stockpiling. Materials from required excavation which are suitable for use as cofferdam fill but are found to be too wet or too dry to obtain the desired compaction may be ordered by the Contracting Officer to be placed in stockpiles for future use in lieu of the procedures described in Paragraph 3.4.2.1. The placement of such material in the disposal area or stockpiles shall be in accordance with the provisions of Paragraph 2.1.7.

3.4.3 Sand Fill and Sand Backfill. Sand fill and sand backfill material shall be wetted by sprinkling after spreading. Each layer shall be kept in a saturated condition during compaction. Prewetting of sand fill and sand backfill at the sources of excavation or borrow will not be required. Sprinkling shall be accomplished by any approved method. All connections in the water supply system shall be watertight. Jets shall not be directed at the embankment with such force that the finer materials will be washed out. The capacities of pumps and sizes of header pipes shall be sufficient to supply the required amount of water at all times. Sluicing will not be permitted.

3.4.4 Stockpiles and Disposal Areas. No moisture control will be required for the uncompacted fill placed in stockpiles and/or the excavated borrow area.

3.4.5 Embankment Dam Fill. After a layer of embankment dam fill material has been dumped and spread, it shall be harrowed to break up and blend the fill materials unless harrowing, as specified under Paragraph 3.4.1, is performed to obtain uniform moisture distribution. Harrowing shall be performed with a heavy disk plow, or other approved harrow, to the full depth of the layer. If one pass of the harrow does not accomplish the breaking up and blending of the materials, additional passes of the harrow may be required, but in no case will more than six passes of the harrow on any one layer be required for this purpose. Harrowing to break up and blend the fill materials will be required even if no harrowing is performed for moisture control. The equipment shall be operated so that the strip being traversed by the roller shall overlap the rolled adjacent strip not less than 2 feet. Portions of the fill which are not accessible to the roller shall be placed in 4-inch layers loose measurement and compacted with power tampers to a degree equal to that obtained in the other portions of the compacted fill by rolling as specified. Dumping, spreading, sprinkling, and compacting may be performed at the same time at different points along a section when there is sufficient area to permit these operations to proceed simultaneously. When, in the prosecution of the work, excavation precedes fill to such an extent that the materials excavated cannot be placed directly in the embankment, such materials shall be stockpiled at approved locations adjacent to the work until their use is authorized. No additional payment will be made for such stockpiling nor for the reloading and hauling of this material to its final position.

3.4.6 Sand Fill and Sand Backfill. After each layer of sand backfill has been dumped and spread the entire surface of the layer shall be compacted by the vibratory rollers to an average relative density of 70 percent or greater with no single value less than 65 percent as determined by ASTM D 4253 and ASTM D 4254. When the fill is inaccessible to a vibratory roller, a mechanical power tamper may be used to compact the fill to the relative densities as listed above. The layer thickness when a mechanical power tamper is used shall be limited to 4 inches prior to compaction. The type and use of mechanical power tampers shall be approved by the Contracting Officer.

3.4.7 Cofferdam Fill. Material for the cofferdam shall consist of a semi-compacted fill placed in layers not more than 12 inches in thickness prior to compaction. Each layer shall be compacted by not less than 4 complete passes of the tamping roller or not less than 2 complete passes of the rubber-tired roller. A complete pass shall consist of the entire coverage of the area with one trip of the equipment specified. Each trip of the tamping roller shall overlap the adjacent trip by not less than one (1) foot. Cofferdam fill to be used in those portions of river and ditch plugs falling in standing water may be placed by dumping into the water until the fill is brought to an elevation which will permit placement and compaction of the cofferdam fill as specified above.

3.4.8 Uncompacted Fill. Material to be placed in the stockpiles, disposal areas, and channel plugs shall be dumped and spread in horizontal layers. Compaction other than that obtained by the controlled movement of the hauling and spreading equipment over the area will not be required.

3.5. SLIDES. In the event of slides in any part of the embankment prior to final acceptance of the work the Contractor shall remove material from the slide area, as directed, and shall rebuild such portion of the embankment. In case it is determined that the slide was caused through the fault of the Contractor, the removal and disposal of material and the rebuilding of the embankment shall be performed without cost to the Government; otherwise this work will be paid for at the applicable contract

unit prices for borrow excavation and compacted fill, otherwise an equitable adjustment to the Contract price will be made.

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SECTION 02270
STONE PROTECTION

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SECTION 02270 - STONE PROTECTION

PART 1 GENERAL

1.1 SCOPE. The work provided for herein consists of furnishing all plant, labor, equipment and materials, and performing all operations in connection with the construction of the stone protection, including foundation preparation, geotextile, bedding layer for the slopes, outlet works, and downstream of the stilling basin, and elsewhere as shown on the contract drawings, in accordance with these specifications and the contract drawings.

1.2 QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all stone protection operations to ensure compliance with contract requirements, and shall maintain records of its quality control for all construction operations, including but not limited to the following:

(1) Foundation preparation (line and grade).

(2) Inspection at the worksite to ensure use of specified materials.

(3) Bedding layer gradation and placement.

(4) Riprap gradation.

(5) Riprap placement.

(6) Geotextile placement.

1.2.2 Gradation Test. The Contractor shall perform a gradation test on riprap at the quarry in accordance with "LMVD Standard Test Method for Gradation of Riprap", a copy of which is attached at the end of this section. At least one gradation test shall be performed on each size of riprap prior to delivery of the material to the job site. The sample shall be taken by the Contractor under the supervision of the Contracting Officer, shall consist of not less than 15 tons of riprap and shall be collected in a random manner, which will provide a sample, which accurately reflects the actual gradation arriving at the job site. If collected by the truckload, each truckload shall be representative of the gradation requirements. The Contractor shall provide all necessary screens, scales and other equipment, and the operating personnel therefor, and shall grade the sample, all at no additional cost to the Government. The contractor shall perform at least one gradation test prior to delivery of the bedding material to the job site in accordance with ASTM C 136. The gradation tests shall be reported using LMV Form 602-R, Gradation Test Data Sheet, a copy of which is attached at the end of this section. Additional tests, at the Contractor's expense, will be required if the stone furnished appears by visual inspection to be of questionable gradation.

1.2.3. Reporting. A copy of the records of inspection and tests, as well as the records of corrective action taken, shall be furnished the Government daily.

1.3 REFERENCES. The following issues of the publications listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

1.3.1 American Society for Testing and Materials (ASTM).

C 127-88(R 1993)	Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate
C 136-96a	Sieve Analysis of Fine and Coarse Aggregates
D 3786-87	Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
D 4632-91	Grab Breaking Load and Elongation of Geotextiles
D 4751-95	Determining Apparent Opening Size of a Geotextile
D 4833-88	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

1.4 SUBMITTALS. Government approval is required for submittals with a GA designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01300 SUBMITTAL PROCEDURES:

1.4.1 Source of Stone. GA. A list of all stone source or sources shall be submitted at least 30 days prior to any placement of stone protection.

1.4.2 Gradation Test Data. FIO. The results of all gradations shall be submitted within 24 hrs. after completion of the test.

1.4.3 Method of Placement. FIO. A detailed description of the method for placing the bedding and riprap shall be submitted at least 30 days prior to any placement of material.

1.4.4 Certificates. FIO. Submit certificates of compliance attesting that the geotextile meets specification requirements.

1.5 SHIPMENT AND STORAGE. The geotextile shall be furnished in a protective wrapping which shall protect the geotextile from direct sunlight, ultra-violet rays, temperatures greater than 140 degree Fahrenheit, mud, dirt, dust and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy duty protective covering.

PART 2 PRODUCTS

2.1 MATERIALS.

2.1.1 Stone.

2.1.1.1 General. All stone shall be durable material as approved by the Contracting Officer. The sources from which the Contractor proposes to obtain the materials shall be selected well in advance of the time when the material will be required. Stone for riprap shall be of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. It shall be free from cracks, seams, and other defects that would tend unduly to

increase its deterioration from natural causes. The inclusion of objectionable quantities of dirt, sand, clay, and rock fines will not be permitted.

2.1.1.2 Sources and Evaluation Testing. All stone shall be obtained in accordance with the provisions in Paragraph 40, STONE SOURCES of the Special Clauses. If the Contractor proposes to furnish stone from a source not listed in paragraph 40, the Contractor shall make such investigations as necessary to determine whether acceptable stone can be produced from the proposed source. Satisfactory service records on work outside the Corps of Engineers will be acceptable. If no such records are available, the Contractor shall make tests to ensure the acceptability of the stone. The tests to which the stone may be subjected will include petrographic analysis, specific gravity, abrasion, absorption, wetting and drying, freezing and thawing, and such other tests as may be considered necessary by the Contracting Officer. The following guidance is provided for use by the Contractor in analyzing a new source of stone. Stone that either weighs less than 155 pounds per cubic foot or has more than 2 percent absorption will not be accepted unless other tests and service records show that the stone is satisfactory. The method of tests for unit weight and absorption will be ASTM C 127-88, (R 1993) entitled Specific Gravity and Absorption of Coarse Aggregate." Samples of stone shall be taken by the Contractor under the supervision of the Contracting Officer at least 60 days in advance of the time the placing of the stone is expected to begin. The tests shall be conducted by the Contractor in accordance with applicable Corps of Engineers methods of test given in the Handbook of Concrete and Cement, and shall be performed at an approved testing laboratory. The cost of testing shall be borne by the Contractor.

2.1.1.3 Gradation. Gradation shall conform to the tables below and to the gradation curves attached at the end of this section, and formats thereof shall be as shown. Neither the width nor the thickness of any piece shall be less than one-third of its length.

TABLE I

400 LB. TOPSIZE RIPRAP

Percent Lighter by Weight (SSD)	Limits of Stone Weight, lb.
100	160-400
50	80-160
15	30-80

TABLE II

90 LB. TOPSIZE RIPRAP

Percent Lighter by Weight (SSD)	Limits of Stone Weight, lb.
100	40-90
50	20-40
15	5-20

2.1.2 Bedding Material.

2.1.2.1 General. Bedding shall consist of crushed stone.

2.1.2.2 Material. The crushed material shall be composed of tough, durable particles, and shall be reasonably free from thin, flat and elongated pieces, and shall contain no organic matter nor soft, friable particles in quantities considered objectionable by the Contracting Officer. Grading shall conform to the following requirements:

Permissible Limits

U.S. Standard Sieve	Percent by Weight Passing
3-inch	90-100
1 1/2-inch	35-70
No. 4	0-5

Crushed stone shall be well-graded between the limits shown. All points on individual grading curves obtained from representative samples of bedding material shall lie between the boundary limits as defined by smooth curves drawn through the tabulated grading limits plotted on a mechanical analysis diagram. The individual grading curves within these limits shall not exhibit abrupt changes in slope denoting either skip grading or scalping of certain sizes or other irregularities which would be detrimental to the proper functioning of the bedding layers.

2.2 GEOTEXTILE. The geotextile shall be of nonwoven or woven sheet construction and consist of long chain polymeric fabric composed of polypropylene, polyethylene, polyester, polyamide or polyvinylidene-chloride fibers weighing 4.0 to 5.0 ounces per square yard, and shall contain stabilizers and/or inhibitors added to the basic plastic if, necessary, to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The fibers shall be oriented into a random web and stabilized whereby they retain their positions relative with each other. The geotextile shall be free of any chemical treatment or coating which reduces permeability and shall be inert to chemicals commonly found in soil. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile. The geotextile shall conform to the following physical property requirements:

Physical Property	Test Procedure	Acceptable Values*
Tensile Strength (Wet)	ASTM D 4632	120 pound minimum in any principal direction
Elongation - (Wet)	ASTM D 4632	At least 15 percent but no greater than 80 percent in any principal direction
Apparent Opening Size	ASTM D 4751	No finer than No. 100 No coarser than No. 70 U.S. Standard Sieve
Puncture Strength	ASTM D 4833	75 pounds minimum
Mullen Burst Strength	ASTM D 3786	300 pounds per square inch minimum

*Unless stated otherwise all numerical values represent average roll values (i.e. any roll in a lot should meet or exceed the minimum value but not exceed the maximum value listed in the table.)

PART 3 EXECUTION

3.1 BASE PREPARATION. Areas on which bedding layers and riprap are to be placed shall be trimmed and/or dressed to conform to cross sections shown on the contract drawings within an allowable tolerance of plus 3 inches and minus 3 inches from the theoretical (slope) lines and grades. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by being filled with bedding material. No additional payment will be made for any material thus required. Immediately prior to placing the bedding layer the prepared base will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

3.1.2 Geotextile Placement. The geotextile shall be placed in the manner and locations shown on the drawings, and shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. At the time of installation the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacturing, transportation, storage or installation at no additional cost to the Government. The surface to receive the geotextile shall be prepared to a relatively smooth condition free of obstructions, depressions and debris. The strips shall be placed to provide a minimum width of 18 inches of overlap for each joint. The upper strip shall overlap the next lower strip. Temporary pinning of the geotextile, to help hold it in place until the bedding layer is placed, will be allowed. The temporary pins shall be removed as the bedding is placed to relieve high tensile stress that may occur during placement of material on the geotextile. Any damage to the geotextile during its installation or during placement of filter material, sand backfill, bedding materials and riprap shall be replaced by the Contractor at no additional cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material will be accomplished within 24 hours after placement of the geotextile. The geotextile shall be protected at all times during construction from contamination by surface run-off and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile. Failure to comply with this requirement will necessitate replacement of the geotextile. Under no circumstances shall any type of equipment be allowed on the unprotected geotextile.

3.2 PLACEMENT OF BEDDING LAYERS.

3.2.1 General. A bedding layer shall be placed on the prepared base as described in Paragraph 3.1, in accordance with either the details shown on the contract drawings and within the limits as shown on the contract drawings, or staked in the field to form a backing for the stone protection.

3.2.2 Placement of Crushed Stone Bedding Material on Prepared Base. Crushed stone bedding material shall be spread uniformly on the prepared base and the geotextile specified herein, to the lines and grades as indicated on the contract drawings and in such manner as to avoid damage to the prepared base. Placing of crushed stone bedding material by methods that tend to segregate the particle sizes within the bedding layer will not be permitted. Any damage to the surface of the prepared base during placing of the bedding material shall be repaired before proceeding with the work. Compaction of bedding material placed on the prepared base will not be required, but the bedding layer shall be finished to present a reasonably even surface, free from mounds or windrows.

3.3 RIPRAP.

3.3.1 General. Riprap shall be placed on the bedding layer specified in Paragraphs 3.1 and 3.2 within the limits shown on the contract drawings. Quarried rock only shall be used. Riprap shall be as specified in Paragraph 2.1.

3.3.2 Placement. Riprap shall be placed in a manner that will produce a reasonably well graded mass of rock with the minimum practicable percentage of voids, and shall be constructed, within the specified tolerance, to the lines and grades either shown on the contract drawings or staked in the field. A tolerance of zero and not more than 3 inches for the 90-lb. topsize riprap and zero and not more than 4 inches for the 400-lb. topsize riprap, from the slope lines and grades shown on the contract drawings will be allowed in the finished surface of the riprap, except that the extreme of this tolerance shall not be continuous over an area greater than 200 square feet. Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid displacing the bedding material. The larger stones shall be well distributed and the entire mass of stones in their final position shall be graded to conform to the gradation specified in Paragraph 2.1.1.3. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping it into chutes, or by similar methods likely to cause segregation of the various sizes, will not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source, by controlled dumping of successive loads during placing, or by other methods of placement which will produce the specified results. The gate releasing mechanism shall be arranged so that it may be operated only from a location at or near the front of the truck. Each truckload shall be representative of the gradation requirements. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well graded distribution of stone sizes as specified above. The Contractor shall maintain the riprap until accepted and any material displaced prior to acceptance and due to the Contractor's negligence shall be replaced at his expense and to the lines and grades shown on the contract drawings.

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SECTION 02271 - MECHANICALLY STABILIZED EARTH WALLS

PART 1 GENERAL

1.1 SCOPE. The work specified herein consists of the design and furnishing of all plant, labor, equipment and materials, and performing all operations required for the erection of mechanically stabilized systems used as retaining walls. These systems employ epoxy coated reinforcement within the selected granular backfill mass with wall units that have a discrete modular precast facing and uniform color throughout.

1.2 QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for the work specified in this section to assure compliance with the contract requirements and maintain records of quality control for all construction operations including, but not limited to, the following:

(1) Materials
(2) Installation
(3) Submittals

1.3 APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.3.1 American Association of State Highway and Transportation Officials (AASHTO).

AASHTO	(1996) Standard Specifications for Highway Bridges – 16th Edition
AASHTO AGC-ARTBA-27	(1990) Subcommittee on New Highway Materials Task Force 27 Report, " In Situ Soil Improvement Techniques"

1.3.2 American Concrete Institute (ACI).

ACI 318/318R	(1995) Building Code Requirements for Structural Concrete and Commentary

1.3.3 American Society for Testing and Materials (ASTM).

ASTM A 884	Standard Specifications for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
ASTM C 31	(1995) Making and Curing Concrete Test Specimens in the Field
ASTM C 39	(1994) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 172	(1990) Sampling Freshly Mixed Concrete

ASTM D 1752	(1984; Rev 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 1785	(1994) Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedules, 40, 80, and 120
ASTM D 3963	Standard Specifications for Fabrication and Jobsite handling of Epoxy-Coated Reinforcing Steel Bars
ASTM D 4632	(1991) Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
ASTM D 4751	(1995) Standard Test Method for Determining Apparent Opening Size of a Geotextile.

1.3.4 California DOT.

CTM 417	Testing Soils and Waters for Sulphate Content.
CTM 422	Testing Soils and Waters for Chloride Content.
CTM 643	Estimating the Service Life of Metal Culverts.

1.3.5 State of Missouri Highway and Transportation Commission.

Missouri Standard Specifications for Highway Construction (1996).

Project Development Manual (1998)

1.3.6 Prestressed Concrete Institute (PCI).

PCI Mnl-117	(1977) Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products
PCI Mnl-121	(1977) Manual for Structural Design of Architectural Precast Concrete

1.4 SUBMITTALS. Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01300 - SUBMITTAL PROCEDURES:

1.4.1 Certificate of Compliance for Backfill Material ; GA. The Contractor shall furnish the Contracting Officer with a Certificate of Compliance, certifying that the selected granular backfill material complies with paragraph SELECTED GRANULAR BACKFILL MATERIAL of these specifications.

1.4.2 Design Data and Computations ; FIO. Prior to construction, the Contractor shall submit appropriate design data and computations to substantiate the design and sizing of the mechanically stabilized walls.

1.4.3 Joint Cover and Joint Filler ; GA. Submit descriptive data for the

joint cover and joint filler.

1.4.4 Water Repellent for Wall Panels; GA. Submit descriptive data for the water repellent solution to be applied to the exterior face of the wall panels.

1.4.5 Insurance; FIO. Submit a copy of the precast wall panel manufacturer's Certificate of Insurance indicating a minimum of $1,000,000 Errors and Omission coverage for final design engineering.

1.4.6 Shop Drawings; GA. Prior to construction, the Contractor shall submit complete shop drawings of the mechanically stabilized walls. Detailed drawings shall include all details, dimensions, quantities and cross sections necessary to construct the mechanically stabilized walls.

1.4.7 Concrete Mixture Proportions; GA. Ten days prior to placement of concrete, submit the mixture proportions that will produce concrete of the quality required. Submit applicable test reports to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

1.4.8 Tests; FIO. Submit copies of all tests performed to ensure contract compliance.

1.4.9 Samples; GA. Submit material samples of each type of the soil reinforcement, joint cover and filler, fastener, and connector. The soil reinforcement samples shall consist of: one 12 inch long and full width piece of reinforcing strip; one square foot piece of reinforcing mesh; or one square foot piece of geosynthetic reinforcement. The joint cover and joint filler sample shall be a minimum of 9 inches long and full width.

1.4.10 Drainage; GA. Prior to construction, the Contractor shall submit a drainage plan for the drainage of the sections of spillway, other temporary construction, or natural slopes that drain to the mechanically stabilized earth wall. Once the Contracting Officer has approved the drainage plan, the Contractor shall submit detailed drawings of the drainage system to the Contractor within 30 days of approval of the drainage plan. The Contractor shall not order materials for drainage along the mechanically stabilized earth wall and barrier rail until the detailed drawings have been approved by the Contracting Officer.

1.5 DESIGN.

1.5.1 Mechanically Stabilized Earth Wall Design. The external and internal stability design of the mechanically stabilized walls shall be the responsibility of the Contractor. All design data and computations shall be signed by a registered professional engineer and shall be submitted in accordance with paragraph SUBMITTALS. The professional engineer may be an employee of the manufacturer. A list of approved wall manufacturers is listed in paragraph APPROVED WALL SYSTEMS. A manufacturer that is not listed may be used, but must first be approved by the Contracting Officer prior to use. The wall shall have a uniform vertical face of modular concrete units or panels and shall be internally stabilized by soil reinforcement. The internal stability design shall be performed by the professional engineer and shall consider earth pressure, seepage pressure, drainage and pullout of soil reinforcement. The width of the stabilized mass, from the back of the wall to the end of the reinforcement, when completed, shall be no less than 0.7 times the wall height or 8 feet, whichever is greater. A concrete leveling

pad shall be provided. The centroid of the wall shall be located over the pad. The mechanically stabilized wall shall be designed and constructed for a life in excess of 75 years. The mechanically stabilized wall shall be designed by established theories of soil mechanics and by published methods supported by experimental data. The size and weight of the prefabricated components shall permit easy handling in the field, and the maximum size and weight of any component shall be suitable for transportation by commercial carrier.

a. Loadings. The mechanically stabilized wall shall be designed to withstand surcharge loads of 300 psf. Water shall be assumed to be at any height in the channel (including a no water case and inundated case), and 3 feet higher behind the wall than on the channel side. The mechanically stabilized wall shall also be designed for Seismic Performance Category B, with a ground acceleration coefficient, A = 0.15.

b. External Stability. The external stability analyses of the MSE Wall shall consider overturning, sliding and bearing. The factors of safety shall be 2.0 for overturning, 1.5 for sliding and 3.0 for bearing, when considering load cases without seismic loads. For seismic design, the factors of safety shall be 1.5 for overturning, 1.1 for sliding and 1.0 for bearing. The random backfill retained by the MSE Wall may be assumed to have an angle of friction equal to 22°. The wall foundation may be assumed to be cohesive, with a cohesion value of 500 psf.

c. Internal Stability. The soil mass shall be designed considering a theoretical failure surface. The failure plane may be established by acceptable theories of soil mechanics or by published experimental data. The soil reinforcement shall extend a sufficient length beyond the failure surface to ensure that failure will not occur due to soile reinforcement pullout. The pull-out resistance shall consider only the length of the reinforcement located in the resistive zone and shall provide a factor of safety against pullout as specified by AASHTO. The length of the soil reinforcing system as measured from the back of the wall to the end of the soil stabilized mass shall be uniform from top to bottom of the mechanically stabilized wall at any cross section. Properties of the reinforced fill as regards to soil strength shall be as shown on the plans.

d. Drainage. The mechanically stabilized wall shall be designed to allow for proper drainage. A drainage plan and detailed drawings shall be designed to insure proper drainage of the spillway and natural slopes as shown in the plans. The drainage system shall have a 75 year life expectancy, and shall be designed in accordance with MoDOT standards, and the Missouri Highway and Transportation Commission – Project Development Manual (1998), Chapter 9 (Hydraulics and Drainage). A conventional drainage system along with an adequate vertical drainage system shall be designed to allow water to drain through, around, and/or under the wall to prevent pore water pressure from developing behind the wall in excess of the pore water pressure for which the wall has been designed.

1.5.2 Drawings. Complete shop drawings shall include all details,

dimensions, quantities, and cross sections necessary to construct the mechanically stabilized walls and shall include but not be limited to the following items:

a. A plan and elevation sheet or sheets for each mechanically stabilized wall shall contain the following:

(1) An elevation view of the wall, at its maximum height, shall indicate the elevation at the top of the wall and at all horizontal and vertical break points; all steps in the concrete leveling pads; the dimensions of the precast panels; the length of the horizontal soil reinforcement from the face of the wall; the type, size and location of the soil reinforcement; the distance along the face of the wall to where changes in length of the soil reinforcement occur; an indication of the original and final ground lines.

(2) A plan view of the mechanically stabilized wall that indicates the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment, and limit of longest soil reinforcement extending from the wall.

(3) All general notes required for the wall construction.

(4) A listing of the summary of quantities shall be provided on the elevation sheet of each wall.

b. All details for the concrete leveling pads shall be provided including all dimensions necessary for construction and the connection between the leveling pads and the bottom of the concrete panels. Details shall also be provided to show all dimensions necessary to construct the concrete panels including all reinforcing steel in each concrete panel and the location of reinforcement connectors embedded in the concrete panels.

PART 2 – PRODUCTS

2.1 PRECAST WALL PANELS. Precast wall panels shall be designed in accordance with ACI 318/318R, PCI Mnl-117, PCI Mnl-121.

a. Compressive Strength. Acceptance of the concrete panels, with respect to compressive strength, will be determined on the basis of production lots. A production lot is defined as a group of panels that will be represented by a single set of compressive strength samples and will consist of panels from a single day’s production. During the production of the concrete panels, the manufacturer will randomly sample the concrete in accordance with ASTM C 172. A single set of compressive strength samples, consisting of a minimum of four cylinders, will be randomly selected from every production lot. Two cylinders shall be cured in the same manner as the panels and tested at 28 days. Two cylinders shall be cured in accordance with ASTM C 31 and tested at 28 days. Compression tests shall be made on standard 6 inches by 12 inches test specimens prepared in accordance with ASTM C 31. Compressive strength testing shall be conducted in

accordance with ASTM C 39. In the event that a production lot fails to meet the specified compressive strength requirements, the production lot shall be rejected.

b. Construction Tolerances. All concrete panels shall be manufactured within the following tolerances;

(1) Panel Dimensions. Position of reinforcement connectors shall be within 1 inch of the locations shown on the approved plans. All dimensions of the concrete panels shall be within 3/16 inch of the dimensions shown on the approved plans.

(2) Panel Squareness. Squareness, as determined by the difference between the two diagonals, shall not exceed ½ inch.

(3) Angular Distortion. Angular distortion with regard to the height of the panel shall not exceed 1/8 inch in 5 feet.

c. Rejection. Panels shall be subject to rejection because of failure to meet any of the requirements specified. Any of the following defects shall also be sufficient cause for rejection:

(1) Defects that indicate imperfect molding.

(2) Defects indicating honeycombed or open texture concrete.

(3) Defects in the physical characteristics for the concrete, such as broken or chipped concrete.

The Contracting Officer shall determine whether spalled, honeycombed, chipped, or otherwise defective concrete shall be repaired or be cause for rejection. Repair of concrete, if allowed, shall be done in a manner satisfactory to the Contracting Officer. Repair to concrete surfaces, which will be exposed to view after completion of construction, shall be approved by the Contracting Officer. Any repairs of panels shall be at no additional cost to the Government.

d. Marking. The date of manufacture, the production lot number, and the piece-mark shall be clearly scribed on the rear face of each panel.

2.2 SOIL REINFORCEMENT.

2.2.1 Steel or Mesh Reinforcement. If steel is selected all fasteners and miscellaneous hardware shall be epoxy coated in accordance with ASTM A 884 or ASTM D 3963, whichever applies to the type of item being coated. The soil reinforcement, reinforcement connectors, and fasteners shall be made of the type and grade material and to the dimensions recommended by the manufacturer in their published specifications. All soil reinforcement,

reinforcement connectors, and fasteners shall be carefully inspected to ensure they are true to size and free from defects that may impact their strength and durability. For walls constructed adjacent to and within 10 feet of a concrete structure, all non-galvanized metallic reinforcement shall be epoxy coated.

2.2.2 Geosynthetic Reinforcement. If geosynthetic reinforcement is selected, the soil reinforcement and reinforcement connectors, shall be geosynthetic material and shall be in accordance with the recommendations of AASHTO AGC-ARTBA-27.

2.3 SELECTED GRANULAR BACKFILL MATERIAL. To insure proper functioning of the structure, the selected backfill materials used in the structure volume shall conform to the following gradation limits and be obtained from natural sources:

Sieve Size	Percent Passing
4 inches	100
No. 40	0-60
No. 200	0-10

The backfill material shall be homogenous throughout.

The backfill material shall conform to all of the following additional requirements:

a. The Plasticity Index (P.I.), as determined by AASHTO T-90, shall not exceed 6.

b. The angle of internal friction shall not be less than 34 degrees as determined by one of the following:

(1) The direct shear test - AASHTO T-236, utilizing a sample of the material compacted to 95 percent of maximum density as determined by AASHTO T-99 Methods C or D (with oversize correction, as outlined in Note 7) at optimum moisture content;

(2) The triaxial compression test - T 234; or

(3) Other means meeting the approval of the Contracting Officer. Tests will ordinarily be waived for crushed stone products where 80 percent of the particles exceed 3/4 inch in size.

c. The dry unit weight of the backfill material shall not be less than 105 pounds per cubic foot as determined by AASHTO T-19, unit weight by rodding or jigging.

d. The material shall substantially be free of shale or other soft, poor durability particles and shall have a magnesium sulfate soundness loss of less than 30 percent after (4) cycles as determined by AASHTO T-104.

e. Selected granular backfill materials shall also meet the following electrochemical requirements:

Requirements	Test Methods
Resistivity > 5000 ohm centimeters	CTM 643
pH 4.5-9.5	CTM 643
pH 5.0-8.0 for polyester geogrids	CTM 643
Organic Content < 1%	CTM 643

Soils with resistances of less than 5000 ohm-cm but greater than 2000 ohm-cm may be accepted if they meet the following additional criteria:

Chlorides $\leq$ 100 parts per million	CTM 422
Sulfates $\leq$ 200 parts per million	CTM 417

Excepting pH and organic content requirements, the electrochemical requirements are waived for wall systems with a totally non-metallic reinforcement and connecting system to the wall units.

Backfill not conforming to this specification shall not be used without written consent of the Contracting Officer.

The Contractor shall furnish to the Contracting Officer a Certificate of Compliance certifying the selected granular backfill material complies with this section of the specifications. A copy of all test results performed by the Contractor or his/her supplier necessary to assure contract compliance shall also be furnished to the Contracting Officer.

Acceptance will be based on the Certificate of Compliance, accompanying test reports, and any applicable tests performed by the Contracting Officer.

The frequency of sampling of selected granular backfill, necessary to assure gradation control throughout construction, shall be as directed by the Contracting Officer.

2.4 FILTER CLOTH. A filter cloth shall be placed at all large block wall joints in front of the selected granular backfill mass. The filter cloth shall be a geotextile meeting the approval of the Contracting Officer and having a grab tensile strength of 180 pounds (ASTM D 4632) and an apparent opening size of 50 to 100 (ASTM D 4751).

2.5 WATER REPELLENT. A water repellent shall be applied to the exterior faces of in-place wall panels. The water repellent shall provide the wall panels with protection against moisture intrusion, resist efflorescence, leaching, mildew and atmospheric staining and shall inhibit freeze/thaw spalling. The water repellent shall not alter the surface color and texture of the wall panels and shall meet the approval of the Contracting Officer.

PART 3 - EXECUTION

3.1 WALL EXCAVATION. Stripping and excavation shall be performed as specified in SECTION 02110 – STRIPPING AND EXCAVATION.

3.2 FOUNDATION PREPARATION. The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcing strips, or as shown on the plans. Prior to wall construction, the contractor shall excavate between station 654+50 and station 657+00 to elevation 382 or as directed by the contracting officer. The excavation shall be made directly beneath the retaining wall and road embankment for a width of 50 feet or as directed by the Contracting Officer. Upon completion, the excavation shall be backfilled with natural gravels to the base of the retaining wall. Material that is classified as suitable shall be incorporated into the sloped portion of the road embankment.

At each panel or wall unit foundation level an unreinforced concrete leveling pad shall be provided as shown on the plans. The concrete leveling pad shall be cured a minimum of 12 hours before placement of wall panels.

3.3 SELECTED GRANULAR BACKFILL PLACEMENT. Backfill placement shall closely follow the erection of each course of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing panels. Any wall materials which become damaged or disturbed during backfill placement shall be either removed or replaced at the Contractor's expense or corrected, as directed by the Contracting Officer. Any misalignment or distortion of the wall facing panels or blocks due to placement of backfill outside the limits of this specification shall be corrected, as directed by the Contracting Officer.

Backfill shall be compacted in accordance with Sec 203 of the Missouri Standard Specifications for Highway Construction with the following exceptions:

a. Minimum density shall not be less than 95 percent of maximum density, as determined by AASHTO T-99.

b. For backfills containing more than 30 percent retained on the 3/4-inch sieve, a method of compaction consisting of at least 4 passes by a heavy roller shall be used.

c. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall have a placement moisture content of not less than 3 percentage points less than optimum and not more than optimum moisture content.

d. Compaction within three feet of the back face of the wall shall be achieved by at least three passes of a lightweight mechanical tamper, roller, or vibratory system.

e. At the end of each day's operation, the Contractor shall slope the last level of the backfill away from the wall facing to rapidly direct runoff away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

f. Geotextile meeting the requirements of the Missouri Standard Specifications for Highway Construction shall be placed behind

and over the backfill to prevent piping of in-situ soil into the backfill.

3.4 INSTALLATION DAMAGE. The effect of installation damage on the reinforcement shall be determined from the result of full scale damage tests using fill material and installation procedures which are project representative or of a more severe nature.

The effect of installation damage test shall be incorporated into the installation damage strength reduction factor RF_{ID}, that is applied to the ultimate limit state reinforcement tensions.

Where installation tests have been made, but with fills or installation procedures other than those representative or site specific on the project, the minimum value of RF_{ID} shall be taken as 1.25. Lower values of RF_{ID} may be only used if substantiated with installation damage test using fills and installation procedures specific to the project.

A default RF_{ID} value of 3.0 shall be used in the absence of any installation damage tests.

3.5 LEVELING PAD. Leveling pads shall be a minimum 12" wide by 6" deep. Concrete for all leveling pads shall be Class B or B1.

3.6 TECHNICAL ASSISTANCE. The Contractor shall obtain the services of a Technical Advisor from the manufacturer to advise the Contracting Officer. This Advisor shall be a qualified representative, acceptable to the Contracting Officer. The Contractor shall be responsible for informing the Advisor prior to the date of installation.

3.7 WATER REPELLENT APPLICATION. The application of the water repellent to the wall panels shall be in accordance with the procedures recommended by the water repellent manufacturer. These procedures may require testing to ensure that the repellent does not damage the wall panels. Surface preparation, protection of surrounding vegetation, environmental conditions necessary for application, method of application and equipment for application shall be as per the water repellent manufacturer’s recommendations.

3.8 DELIVERY, STORAGE, AND HANDLING. Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with ground.

3.8.1 Precast Wall Panels. Precast wall panels shall be handled, stored, and shipped in such manner as to eliminate the danger of chipping, discoloration, cracks, fractures and excessive bending stresses. The panels shall be stored in a manner specified by the manufacturer and in a flat area. Panels shall be marked with shop drawing identification.

3.8.2 Geosynthetic Reinforcement. The Contractor shall check the geosynthetic reinforcement upon delivery to ensure that the proper material has been received. Geosynthetic reinforcement shall be stored at temperatures above –20 ℉ and below 140 ℉. The Contractor shall prevent excessive mud, wet cement, epoxy, and like materials, which may affix

themselves to the geosynthetics from coming in contact with the geosynthetic material. Rolled geosynthetic material may be laid flat or stood on end for storage. The soil reinforcement or rolls shall not be dropped or dragged.

3.8.3 Metallic Reinforcement. Metallic reinforcement shall be transported with care and stored above the ground on wooden or padded supports. The soil reinforcement or bundles shall not be dropped or dragged.

3.9 APPROVED WALL SYSTEMS. The following wall suppliers and systems listed below have been pre-approved by MoDOT:

3.9.1 Approved Large Block Wall Systems.

(1) Reinforced Earth Company (Metallic System only)
Central Region
1331 Airport Freeway
Suite 302
Euless, TX 76040
Phone 817-283-5503 Fax 817-283-6931

(2) L.B.Foster Geotechnical
1372 Old Bridgeroad
Suite 101
Woodbridge VA. 22192
Phone 703-499-9818
Fax 703-499-9348
(Formerly VSL Corp.)

(3) T & B Structural Systems Inc. (HSE or RSE Panel Wall Systems only)
637 W. Hurst Boulevard
Hurst, Texas 76053
Phone 817-280-9858 Fax 817-280-9864

(4) Gifford-Hill & Company
Concrete Products Division
2515 Mckinney Avenue
Dallas, Texas 75201
P.O. Box 190999, Dallas, Texas 75219-0999
Phone 214-754-5500

(5) Isogrid Retaining Wall System and (T-Wall System only)
The Neel Company
8328 Traford Lane
Suite D
Springfield, VA 22152
Phone 703-913-7850 Fax 703-913-7859

(6) Tensar ARES Retaining Wall System
Tensar Earth Technologies, Inc.
5775-B Glennridge Drive
Lakeside Center, Suite 450
Atlanta, GA 30328

Phone 404-250-1290 Fax 404-250-9056

(7) Strengthened Soil System
Shaw Technologies, Inc.
P.O. Box 654
Collyville, Texas 76034
Phone 817-427-0997 Fax 817-427-0998

SECTION 02500
BASE COURSE AND ASPHALTIC CONCRETE SURFACING

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SECTION 02500
BASE COURSE AND ASPHALTIC CONCRETE SURFACING

PART 1 – GENERAL

1.1 SCOPE. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment and materials and performing all work, except earthwork, necessary to complete the access road and hiking/biking trail including aggregate base course and asphaltic concrete paving, as shown on the drawings and specified herein. Excavation is covered in SECTION 02110 – STRIPPING AND EXCAVATION. Concrete is specified in SECTION 03301 - CONCRETE.

1.2 QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of its quality control for all construction operations, including but not limited to the following:

(1) Aggregate base course and asphaltic concrete surfacing (construction, bituminous coating, gradation, etc.)

(2) Asphaltic concrete surfacing (temperature, placing, rolling, coring, mix). At the beginning of production the Contractor shall run an extraction test (ASTM D 2172) and sieve test (ASTM C 136) on each of the asphaltic concrete mixtures being used. Additional extraction and sieve tests, at the Contractor's expense, will be required by the Contracting Officer if the material appears unacceptable. A certificate of inspection shall be submitted for each shipment of asphalt for the job.

1.2.2 Reporting. A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government daily.

1.3 APPLICABLE PUBLICATIONS. The following publications of the current issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:

1.3.1 American Society for Testing and Materials (ASTM).

C 136-96 (Rev A)	Sieve Analysis of Fine and Coarse Aggregates
D 1557-91	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu.ft. (2,700 kN-m/cu.m.))
D 1559-89	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 2172-95	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

1.3.2 Missouri Standard Specifications. The materials for, and construction of the surface course, combination inlet and other appurtenances

shall conform to the applicable provisions of the hereinafter cited sections and, as specified, articles of the State of Missouri, Missouri Highway and Transportation Commission, "Missouri Standard Specifications for Highway Construction" dated 1999. The term "Engineer" as used therein shall be interpreted to mean "Contracting Officer."

1.4 SUBMITTALS. Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted to the Contracting Officer in accordance with SECTION 01300 - SUBMITTAL PROCEDURES:

1.4.1 Data. FIO. Submit data and specification compliance for asphalt.

PART 2 – PRODUCTS

2.1 ASPHALTIC CONCRETE PAVEMENT.

2.1.1 General. This work consists of constructing the access road. The Contractor shall not move or operate any type of equipment of such weight or so loaded that it will cause damage to any portion of the surface either being constructed or in existence, as determined by the Contracting Officer.

2.1.2 Subgrade Preparation. SECTION 209, SUBGRADE PREPARATION.

2.1.3 Aggregate Base Course, Type 1. SECTION 304, AGGREGATE BASE COURSE. Articles 304.1, 304.2 (Type 1 Aggregate), 304.3.3 through 304.3.6.

2.1.4 Asphaltic Prime Coat. SECTION 408, PRIME COAT, Articles 408.1 through 408.4.4, except that material for the prime coat shall be MC-30 and shall be applied at a rate of not more than 0.30 gallon per square yard of base course (exact rate to be determined by the Contracting Officer). The prime coat shall not be applied when moisture content of top 3 inches of base course exceeds 65 percent of optimum or when weather conditions are unsuitable.

2.1.5 Asphaltic Concrete Surfacing. SECTION 401, PLANT MIX BITUMINOUS PAVEMENT. Articles 401.1, 401.2 (except asphaltic cement, AC-5 or AC-10, shall be used), 401.3.1, 401.3.3 (except asphaltic cement shall be between 5.0 and 7.0 percent), 401.3.6, 401.3.7, 401.5 through 401.9.2 and 401.12.

2.1.5.1 Job-Mix Formula. If the asphaltic concrete can be obtained from a site which has been producing the required mix specified in Paragraph 2.1.5, for the Missouri State Highway Department or County, that job-mix formula shall be used. This formula will be acceptable provided the same sources are used for the applicable materials and a satisfactory mix is being furnished.

2.1.5.2 Alternate Job-Mix Formula. In the event the job-mix formula for the State is not available, the Contractor shall be responsible for the design of the bituminous mix. A minimum of 30 days prior to the laying of asphaltic concrete, the Contractor shall submit to the Contracting Officer for approval, a job-mix formula derived from the Marshall Test in accordance with ASTM D 1559. The job-mix formula shall be developed for the medium traffic category with five asphalt contents. The Marshall Test data shall be submitted with all laboratory curves to support the percentage of asphalt chosen, the source of all materials, the gradation of the different sizes of aggregates, the optional gradation selected, and the composite percentage of

each sieve fraction of the combined aggregate. The laboratory curves submitted shall be unit weight, stability, flow, percent air voids, and percent V.M.A. plotted vs. asphalt content.

2.1.5.3 Field Control. The maximum variation from the approved job-mix formula shall be as specified in Article 401.3.6. Any variation from the job-mix formula in the grading of the aggregate, or in the asphalt content greater than the tolerances, shall be investigated and the conditions causing the variation corrected.

2.2 EQUIPMENT. Equipment shall consist of suitable sweepers, handbrooms, air compressor, pouring buckets, rubber-edged squeegees, and cutting knives. All hand tools shall be in a clean condition.

2.3 EARTH SHOULDERS.

2.3.1 All shoulders shall be earth shoulders. Preparation, compaction, and shaping earth shoulders shall meet the applicable requirements specified in SECTION 02220.

PART 3 - EXECUTION

3.1 AGGREGATE BASE COURSE, TYPE 1. The base course aggregate shall be placed, beginning at the point of shortest haul, in such a manner that the hauling of the base course aggregate over the subgrade shall be held to the absolute minimum as approved by the Contracting Officer. The base course aggregate shall be placed between 15 April and 15 October, inclusive, and shall be covered with the bituminous surfacing specified below during the same construction season that the base is placed. Base material for bituminous surfacing shall be placed to the width and thickness specified within 60 days of the time when bituminous surfacing is to be placed. The tolerance in base course thickness shall be as stated in Article 304.3.5.5. The Contractor shall check the completed thickness of the base course by taking at least one measurement for each 1000 square yards placed.

3.2 ASPHALTIC CONCRETE SURFACING. The asphaltic concrete surfacing shall be constructed to the thickness indicated on the drawings. Determination of this thickness will be based on measurements of cores obtained by the Contractor in accordance with Article 401.14. Thickness shall be controlled to a minus tolerance of 1/4 inch. If the thickness of the asphaltic concrete surfacing is deficient in excess of 1/4 inch as determined by the core measurements, the total area that is deficient in thickness shall be determined by additional cores. The area found to be deficient shall be removed and replaced at proper thickness, all at no additional expense to the Government.

3.3 GEOTEXTILE. The Contractor shall apply geotextile at all locations where new asphaltic concrete is to be placed adjacent to an existing asphalt area, or where there are large cracks in existing surfacing which is to be overlaid with a new 2 inch layer of asphaltic concrete surfacing, or as directed by the Contracting Officer. The purpose of the geotextile is to prevent reflective cracking in the top layer of new asphaltic concrete surfacing. The geotextile shall meet the requirements specified in SECTION 02270.

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SECTION 02520
PRESTRESSED CONCRETE CYLINDER PIPE

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SECTION 02520
PRESTRESSED CONCRETE CYLINDER PIPE

PART 1 - GENERAL

1.1 SCOPE. The work covered by this section consists of furnishing all plant, labor, material, and equipment, and performing all operations necessary for the prestressed concrete pressure pipe, steel cylinder type, and appurtenances as specified herein and as shown on the drawings.

1.2 QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of quality control for all construction operations, including, but not limited to the following:

(1) Compaction.
(2) Installation of prestressed concrete cylinder pipe.
(3) Joint Testing

1.2.2 Reporting. A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government daily.

1.3 REFERENCES. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

1.3.1 American Society for Testing and Materials (ASTM).

D 1310-86 (R 97)	Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D 2822-91	Asphalt Roof Cement

1.3.2 American Water Works Association (AWWA) Standards .

C 301-92	Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
C 304-92	Design of Prestressed Concrete Cylinder Pipe

1.4 SUBMITTALS. Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01300 SUBMITTAL PROCEDURES:

1.4.1 Data.

(1) Asphalt Roof Cement; GA. Submit manufacturer's literature.

(2) Prestressed concrete cylinder pipe; GA. Submit all design calculations including sketches and all backup computations.

1.4.2 Drawings.

(1) Construction Plan; GA. Before starting installation of any materials or equipment, the Contractor shall prepare and submit to the

Contracting Officer, complete shop drawings of all work covered by this section of the specifications which requires fabrication. Where materials or equipment are standard stock products of manufacturers, full descriptive data shall be submitted, including catalog cuts and specifications. These shop drawings shall include as a minimum the following drawings and catalog cuts:

(i) Prestressed concrete cylinder pipe and fittings.

(ii) Layout of pipe and all pipe lengths used.

(2) Installation Details; GA. Shop drawings showing installation details for the gages, diaphragms, connecting bands and similar items, shall be submitted.

1.4.3 Reports. Prestressed Concrete Cylinder Pipe; GA. Submit results of tests specified in paragraph 1.5.

1.5 TESTING.

1.5.1 Shop Testing Concrete Pipe. The full length of concrete pipe and joints under dams shall be tested for leakage as follows: A hydrostatic test shall be made on the watertight joint types proposed. Only one sample joint of each type needs shop testing; however, if the sample joint fails because of faulty workmanship, an additional sample joint may be tested. During the test period, the joint shall be protected from high temperatures that might soften or adversely affect the jointing materials. The possibility that some water may be absorbed by concrete pipes during the test will be considered before rejecting any rubber seals proposed. Performance requirements for joints in prestressed concrete cylinder pipes shall be in accordance with AWWA standards except that tests shall be performed at an internal hydrostatic pressure of 40 psi minimum for a 20-minute period.

1.5.2 Field Joint Tests. Hydrostatic pressure tests on all concrete pipe joints under dam shall be made by the Contractor after the pipe has been installed but prior to placing of the concrete cradle, the grouting or mortaring of joints, and any backfill except that required for bedding the pipe. Testing of joints shall be made by use of a Contractor-furnished Joint Tester approved by the Contracting Officer. Joints shall be required to withstand an internal hydrostatic pressure 40 psi minimum without visible leakage for 20 minutes. After backfilling the pipe, the Contracting Officer may require additional hydrostatic tests of any joints which by inspection do not appear to be watertight.

PART 2 - PRODUCTS

2.1 MATERIALS.

2.1.1 Asphalt Roof Cement. Asphalt roof cement shall conform to ASTM D 2822, Type I, Class as appropriate. The solvent shall have a flash point of not less than 80 degrees F when tested in accordance with ASTM D 1310.

2.1.2 Prestressed Concrete Cylinder Pipe and Fittings. The prestressed concrete cylinder pipe shall be of the size indicated on the drawing and shall conform to AWWA C 301 with rubber gasket joints of the type using steel bell and spigot joint rings. The pipe shall be designed to withstand a D-load of 12,037 pounds per linear foot to produce a 0.01-inch crack.

2.1.3 Joint Lubricant. Joint lubrication shall be as recommended by the pipe manufacturer.

2.1.4 Joint Grout. Joint grout for exterior joint recess shall be as

specified in paragraph 3.2.3 of this section.

2.1.5 Joint Mortar. Joint mortar for interior joint recesses shall be as specified in paragraph 3.2.3 of this section.

2.1.6 Geotextile. Geotextile materials shall conform to the requirements of SECTION 02270.

2.2 PIPE FOUNDATION.

2.2.1 Backfill Materials. Materials for pipe foundation fill shall be as specified in paragraph 3.1.2 of this section.

2.2.2 Compaction Equipment. Manual tampers shall weigh not less than 20 pounds and have a tamping face not larger than 6 inches by 6 inches. All hand-operated power tampers and vibratory compactors must be field checked prior to their use on the project to assure that the required results can be obtained. Such field checks shall be accomplished under the direction and supervision of the Contracting Officer. Equipment failing to achieve desired results will not be allowed on the project.

PART 3 - EXECUTION

3.1 PIPE FOUNDATION.

3.1.1 Excavation. The pipe foundation shall be accurately shaped to accept the lower 20-inches of the outlet works pipe. The excavation shall be maintained in-the-dry and the Contractor shall be prepared to pump any surface or seepage water.

3.1.2 Materials. Backfill shall be made with suitable materials, as herein specified, obtained from the stockpiles and from borrow area shown on the drawings. Materials which are too wet or too dry shall be processed so that the material in each layer of backfill shall contain the amount of moisture required to obtain the density hereinafter specified. The moisture content shall be as uniform as practical throughout the layer. No frozen material shall be placed as backfill nor shall backfill be placed upon or against frozen surfaces. All material shall be placed as hereinafter specified. Materials shall consist of the following classifications of the Unified Soils Classification System:

(1) Drainage Fill. Clean sands conforming to the following gradation:

Sieve Size U.S. Standard Square Mesh	Percent Passing by Weight
3/8 Inch	100
No. 100	5 max.

(2) Mechanically Tamped Backfill. Lean clay, sandy or silty clay (CL).

3.1.3 Backfill Placement and Compaction.

3.1.3.1 General. The completed backfills shall correspond to the shape of the typical sections and final contours indicated on the drawings. The backfills shall be constructed to the lines, slopes, and grades shown on the drawings. All backfills within 2 feet of any concrete structure shall be placed and compacted as specified below. Backfill beyond 2 feet from any concrete pipe shall be placed and compacted as specified in SECTION 02220.

3.1.3.2 Drainage Fill. Each layer of material for the drainage fill shall be spread in layers not more than 6 inches in thickness if within 2 feet of concrete structures, and compacted by 4 passes using hand-operated vibratory compactors. The drainage fill shall be kept saturated during compaction, but sluicing will not be permitted.

3.1.3.3 Mechanically Tamped Backfill. Backfill from the stockpiles and from the borrow shall be placed or spread in layers, the first layer not more than 6 inches in thickness and the succeeding layers not more than 8 inches in thickness prior to compaction. Layers shall be started full out to the slope stakes and shall be carried substantially horizontal with sufficient crown or slope to provide satisfactory drainage during construction. When the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be adequately scarified before the succeeding layer is placed thereon.

3.1.3.3.1 Backfill Compaction. Compaction of each layer shall be in accordance with the requirements of SECTION 02220, as applicable. The backfill within 4 feet horizontally and within a vertical dimension above the pipe as recommended by the pipe manufacturer shall be compacted with the use of mechanical or pneumatic power impact tampers and with manual tampers. When compacting under the haunch of pipes, a pole or a 2-inch by 4-inch piece of lumber shall be used to achieve desired density in this area. Such effort will be followed by the use of power or manual tampers working as close to the pipe as possible without damaging the outlet works pipe.

3.1.4 Ditches and Depressions. All ditches, as shown on the drawings, shall be filled to the natural surface of the ground with suitable material to a height sufficient to ensure drainage after shrinkage of the fill.

3.2 INSTALLATION OF OUTLET WORKS PIPE.

3.2.1 General. Prior to installing the drainage pipe, excavation and foundation preparation shall have been completed as prescribed in Paragraph 3.1. Under no circumstances shall the pipe be laid in water, or when conditions or the weather are unsuitable for work. The pipe shall be carefully inspected by the Contracting Officer immediately before it is laid and defective pipe will be rejected. Proper facilities shall be provided for lowering sections of pipe into place, and pipe shall be cleaned and lowered into position in such a manner as to avoid damage to the pipe. Pipe laying lengths shall not exceed 12 feet. Two half-lengths of pipe shall be used immediately downstream of the intake structure, and immediately upstream of the outlet structure. The pipe shall be laid on a foundation to the grades and alignment as shown on the drawings. The pipe shall be supported in such a manner that does not damage the pipe or pipe joints and such that the pipe is at the grade and alignment shown on the drawings. Each section of pipe shall rest upon the pipe bed for its full length with recesses excavated or formed to accommodate the joints. Any pipe that has its grade or joint disturbed after laying shall be taken up and relaid. Any section of pipe already laid which is found to be defective or damaged shall be taken up and relaid or replaced as directed by the Contracting Officer, without additional cost to the Government. During installation, the pipe shall be handled with care. After all joining of sections has been accomplished, backfill shall be placed as specified in Paragraph 3.1.

3.2.2 Pipe Joints. Joints between sections of concrete pipe shall comply with the manufacturer's instructions. Gaskets shall not have more than one factory-fabricated splice. Gaskets shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives and

other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets shall be inspected before installing the pipe; any loose or improperly affixed gaskets shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint, the gasket becomes loose and can be seen through the exterior joint recess when the joint is pulled up to within one inch of closure, the pipe shall be removed and the joint remade. The external annular space shall be filled with cement grout or with a portland cement-filled polyurethane loop. The internal annular space shall be filled with cement mortar and struck off to ensure a smooth and continuous surface between pipe sections.

3.2.3 Grout. Grout for exterior joint protection on concrete pipes shall be a mix of 1 part portland cement, 2 parts sand, and of sufficient liquid consistency to flow into the joint recess beneath a diaper furnished by the pipe manufacturer. Mortar for interior joint protection shall be a mix of 1 part portland cement and 1 part sand. A polyurethane foam loop, impregnated with portland cement, may be substituted for grout for exterior joints.

3.2.4 Geotextile Installation Around Pipe Joints. Geotextile shall be in accordance with applicable parts of SECTION 02270. Prior to placing geotextile, surfaces to receive the geotextile shall be coated with asphalt roof cement to hold the geotextile in place. The surface to receive the geotextile shall be prepared to relatively smooth condition, free of obstructions and debris. All pipe joints shall be wrapped with geotextile for a distance of 3 feet each side of the joint. All geotextile wrapping shall be overlapped 6 inches and secured to prevent displacement during backfilling operations. The geotextile shall be covered with compacted backfill within 24 hours of placement. Any geotextile damaged during its installation or during backfilling shall be replaced by the Contractor at no additional cost to the Government.

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SECTION 02620
DUCTILE IRON PIPE, INTERCEPTOR SEWER

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SECTION 02620
DUCTILE IRON PIPE, INTERCEPTOR SEWER

PART 1 – GENERAL

1.1. SCOPE. This section covers ductile iron pipe. Ductile iron pipe shall be furnished complete with all fittings, jointing materials, blocking, encasement, and other appurtenances.

Piping shall be tested in accordance with the pipeline pressure and leakage testing section.

At the Contractor’s option, the pipe may be ductile iron pipe, or prestressed concrete cylinder pipe.

1.2. SUBMITTALS. Government approval is required for submittals with a GA designation; submittals having an "FIO" designation are for information only. The following shall be submitted to the Contracting Officer in accordance with SECTION 01300 SUBMITTAL PROCEDURES:

1.2.1 Certificates. FIO. Certification by manufacturer for each item furnished in accordance with the ANSI/AWWA Standards. Submittal data shall clearly indicate the country of origin of pipe, fittings, restraining devices, and accessories. When requested by the Contracting Officer, certified copies of physical and chemical test results shall be submitted for the materials to be provided.

1.2.2 Certificates. FIO. Certification of gaskets. The Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.2.3 Certificates. FIO. Certification of proof-of-design tests for joints.

1.2.4 Certificates. FIO. Certification of proof-of-design tests for welded-on outlets.

1.2.5 Schedules. FIO. Laying schedule complete with an explanation of all abbreviations used in the schedule.

1.3. HANDLING. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Unpadded hooks, wire brushes or other abrasive tools shall not be permitted to come into contact with the polyethylene lining.

Pipe and fittings in which the lining has been damaged shall be replaced. With the concurrence of the Contracting Officer, small and readily accessible damaged areas may be repaired.

The Contractor shall repair any damage to pipe coatings before the pipe is installed.

1.4 APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.4.1 American Water Works Association (AWWA).

C 105	Polyethylene Encasement for ductile-Iron Piping for Water and Other Liquids
C 110	Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. for Water and Other Liquids
C 111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C 151	Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
C 153	Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids
C 210	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
C 600	Installation of Ductile-Iron Water Mains and Their Appurtenances

1.4.2 American Society for Testing and Materials (ASTM).

D 1248	Polyethylene Plastics Molding and Extrusion Materials

PART 2 – PRODUCTS

2.1. PIPE CLASS. The class of ductile iron pipe shall be as indicated in the following table:

Location	Nominal Size inches	ANSI/AWWA Class
56 + 17.92 to 99 + 52.51	20	50

Note

The specified class includes corrosion allowance and casting allowance.

2.2 MATERIALS.

Pipe	Ductile iron, ANSI/AWWA C151/A21.51, Table 1 or Table 3; class as indicated herein.
Gaskets – All Joint Types	Gaskets shall be synthetic rubber. Natural rubber will not be acceptable.
Fittings	ANSI/AWWA C110/A21.1 (except shorter laying lengths will be acceptable for U.S. Pipe), or ANSI/AWWA C153/A21.53, all with 250 psi or greater working pressure rating.
Fittings	All fittings shall be suitable for a test pressure of 1.5 times rated working pressure without leakage or damage.
Push-on Joints	ANSI/AWWA C111/A21.11, except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.
Mechanical Joints	ANSI/AWWA C111/A21.11, except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.
Wall Castings	Mechanical joint with water stop and tapped holes; single casting or fabricated ductile iron. All holes shall be sized in accordance with the details on the drawings and shall be provided with removable plugs.
Shop Coating and Lining	
Asphaltic Coating	Manufacturer’s standard.
Coal Tar Epoxy	Manufacturer’s standard.
Liquid Epoxy	ANSI/AWWA C210.
Rust-Preventive Compound	As recommended by pipe manufacturer.

Polyethylene Tube	Seamless, ANSI/AWWA C105/A21.5; LLD-8 mil or HDCL-4 mil.
Polyethylene Lining	ASTM D1248, Class C, heat bonded, 30 mil nominal thickness, except min thickness shall be at least 25 mils. Thickness may taper to not less than 10 mils beginning 4 inches from the end of pipe or fitting.

2.3. SHOP COATING AND LINING. The interior of all pipe for gravity sewers shall be polyethylene lined.

PART 3 – EXECUTION

3.1. INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; spigot ends shall be examined with particular care. All defective pipe and fittings shall be removed from the site of the work.

3.2. PREPARATION. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.

Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other objects shall not be placed in or allowed to enter the pipe.

3.3. CUTTING PIPE. Cutting shall be done in a neat manner, without damage to the pipe or the lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the ends of the pipe shall be dressed with a file or power grinder to remove all roughness and sharp edges. The cut ends of push-on joint pipe shall be suitably beveled.

Ends of ductile iron pipe shall be cut with a portable guillotine saw, abrasive wheel, saw, milling cutter, or oxyacetylene torch. The use of hydraulic squeeze type cutters will not be permitted. Field-cut holes for saddles shall be cut with mechanical cutters; oxyacetylene cutting will not be permitted.

3.4. ALIGNMENT. Piping shall be laid to the lines and grades indicated on the drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections form a straight line or grade shall not exceed the values stipulated in Table 4 or Table 5 of AWWA C600, unless specially designed bells and spigots are provided.

Either shorter pipe sections or fittings shall be installed where required to conform to the alignment or grade indicated on the drawings.

Batter boards, laser beam equipment, or surveying instruments shall be used to maintain alignment and grade.

If batter boards are used to determine and check pipe subgrades, they shall be erected at intervals of not more than 25 feet. At least three batter boards shall always be maintained in proper position when trench grading is in progress.

If laser beam equipment is used, periodic elevation measurements shall be made with surveying instruments to verify accuracy of grades. If such measurements indicate thermal deflection of the laser beam due to differences between the ground temperature and the air temperature within the pipe, precautions shall be taken to prevent or minimize further thermal deflections.

3.5. LAYING PIPE. Pipe shall be protected from lateral displacement by placing the specified pipe embedment material. Under no circumstances shall pipe be laid in water, and no pipe shall be laid under unsuitable weather or trench conditions.

Whenever pipe laying is stopped, the open end of the pipe shall be sealed with a watertight plug, which will prevent trench water from entering the pipe.

Pipe shall be laid with the bell ends facing the direction of laying, except when reverse laying is specifically authorized by the Contracting Officer.

3.6. FIELD JOINTS. Joints in buried locations shall be mechanical or push-on type unless otherwise indicated on the drawings. Bells on wall castings and wall sleeves shall be mechanical joint type, with tapped holes for tie rods or stud bolts. All other joints shall be flanged unless otherwise indicated on the drawings.

Certification of joint design shall be provided in accordance with ANSI/AWWA C111/A21.11-90, Section 4-5, Performance Requirements, as modified herein. The joint test pressure shall be not less than 2 times the working pressure or
1-1/2 times the test pressure of the pipeline, whichever is higher. The same certification and testing shall also be provided for restrained joints. For restrained joints, the piping shall not be blocked to prevent separation and the joint shall not leak or show evidence of failure. It is not necessary that such tests be made on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and manufactured from materials of equivalent type and quality may be accepted as adequate proof of design.

3.7. MECHANICAL JOINTS. Mechanical joints shall be carefully assembled in accordance with the manufacturer’s recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11. Overtightening of bolts to compensate for poor installation practice will not be permitted.

3.8. PUSH-ON JOINTS. The pipe manufacturer’s instructions and recommendations for proper jointing procedures shall be followed. All joint surfaces shall be lubricated with heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and

shall be kept clean. Each spigot end shall be suitably beveled to facilitate assembly.

3.9. POLYETHYLENE TUBE PROTECTION. All buried ductile iron pipe, including all straight pipe, bends, tees, adapters, closure pieces, and other fittings or specials, and all valves shall be provided with a minimum of one wrap of polyethylene tube protection.

Polyethylene tube protection shall be installed in accordance with AWWA C105, Method A. Preparation of the pipe shall include, but is not limited to, removing lumps of clay, mud, cinders, etc., prior to installation.

Where ductile iron pipe is also embedded or encased in concrete, the polyethylene tube shall be installed over the pipe for 5 feet either side of each end of the concrete encasement.

The terms “polyethylene tube protection” and “polyethylene encasement” are interchangeable and shall have the same meaning in these Contract Documents.

3.10. WALL CASTINGS. Unless otherwise indicated on the drawings, wall castings shall be provided where ductile iron pipes pass through concrete walls.

3.11. CONCRETE ENCASEMENT. A joint shall be provided within one foot of each end of the concrete encasement. Concrete encasement shall be installed as indicated on the drawings. Concrete and reinforcing steel shall be as specified in the cast-in-place concrete section. All pipe to be encased shall be suitably supported and blocked in proper position, and shall be anchored to prevent flotation.

3.12. LEAKAGE. All joints shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of the Contractor.

3.13. CLEANING. The interior of all pipe and fittings shall be kept clean of any foreign matter until the work has been accepted.

End of Section

SECTION 02720
CMP CULVERTS AND APPURTENANCES

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SECTION 02720
CMP CULVERTS AND APPURTENANCES AND GUARDRAIL

PART 1 – GENERAL

1.1 SCOPE. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment and materials and performing all work, except earthwork, necessary to complete the pipe culverts including metal end sections, as shown on the drawings and specified herein. Excavation is covered in SECTION 02110 – STRIPPING AND EXCAVATION. Concrete is specified in SECTION 03301 - CONCRETE.

1.2 QUALITY CONTROL.

1.2.1 General. The Contractor shall establish and maintain quality control for all operations to assure compliance with contract requirements and maintain records of its quality control for all construction operations.

1.2.2 Reporting. A copy of these records and tests, as well as the records of corrective action taken, shall be furnished to the Government daily.

1.3 APPLICABLE PUBLICATIONS. The following publications of the current issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto:

1.3.1 American Association of State Highway and Transportation Officials (AASHTO).

M 246-87	Precoated Galvanized Steel Sheet for Culverts and Underdrains
M 274-87	Steel Sheet, Aluminum Coated (Type 2) by the Hot-Dip Process for Sewer and Drainage Pipe

1.3.2 Missouri Standard Specifications. The materials for, and construction of the surface course, combination inlet and other appurtenances shall conform to the applicable provisions of the hereinafter cited sections and, as specified, articles of the State of Missouri, Missouri Highway and Transportation Commission, "Missouri Standard Specifications for Highway Construction" dated 1999. The term "Engineer" as used therein shall be interpreted to mean "Contracting Officer."

1.4 SUBMITTALS. Government approval is required for submittals with a GA designation; submittals having an "FIO" designation are for information only. The following shall be submitted to the Contracting Officer in accordance with SECTION 01300 - SUBMITTAL PROCEDURES:

1.4.1 Data. FIO. Submit full descriptive data including detail drawings and specification compliance for corrugated steel pipe culverts.

PART 2 – PRODUCTS

2.1 PIPE CULVERTS.

2.1.1 General. Pipe culverts shall be corrugated steel pipe conforming to the requirements set forth below. Steel flared end sections shall be furnished for all culvert ends unless otherwise indicated. Backfill around the culvert pipes shall be in accordance with SECTION 725, METAL PIPE AND PIPE-ARCH CULVERTS, Article 725.6 and SECTION 02220-3.2.1. All installations shall be approved by the Contracting Officer prior to placing the aggregate base course. The Contractor shall make whatever measurements are necessary to ensure that after the road embankment is placed , the side slopes meet the requirements of the drawings.

2.1.1.1 Materials. Steel pipe culverts, end sections and coupling bands shall be in accordance with the applicable provisions of SECTION 1020, CORRUGATED METALLIC-COATED STEEL CULVERT PIPE, PIPE-ARCHES, AND END SECTIONS.

2.1.1.2 Pipe Coatings. The corrugated steel pipe shall be coated with commercially pure aluminum in accordance with AASHTO M 274; or coated with ethylene-acrylic acid (EAA) polymer or polyvinyl chloride (PVC) in accordance with AASHTO M 246.

2.1.1.3 Granular Backfill. This material shall be approved by the Contracting Officer prior to installing the culverts. Compaction equipment or methods that produce horizontal or vertical earth pressure which cause excessive distortion or damage to structures shall not be used.

PART 3 – EXECUTION

3.1 Granular Backfill. A granular material shall be used around and 6-inches over the top of the culverts but not higher than the bottom of the base or surface course. The granular backfill shall be placed in horizontal, uniform layers not exceeding 8-inches in thickness, before compaction and shall be brought up compacted to a relative compaction of not less than 90% per ASTM D 1557.

3.2 Culvert Installation. Steel pipe culverts, end sections, and coupling bands shall be installed in accordance with the applicable provisions of SECTION 725, METAL PIPE AND PIPE-ARCH CULVERTS.